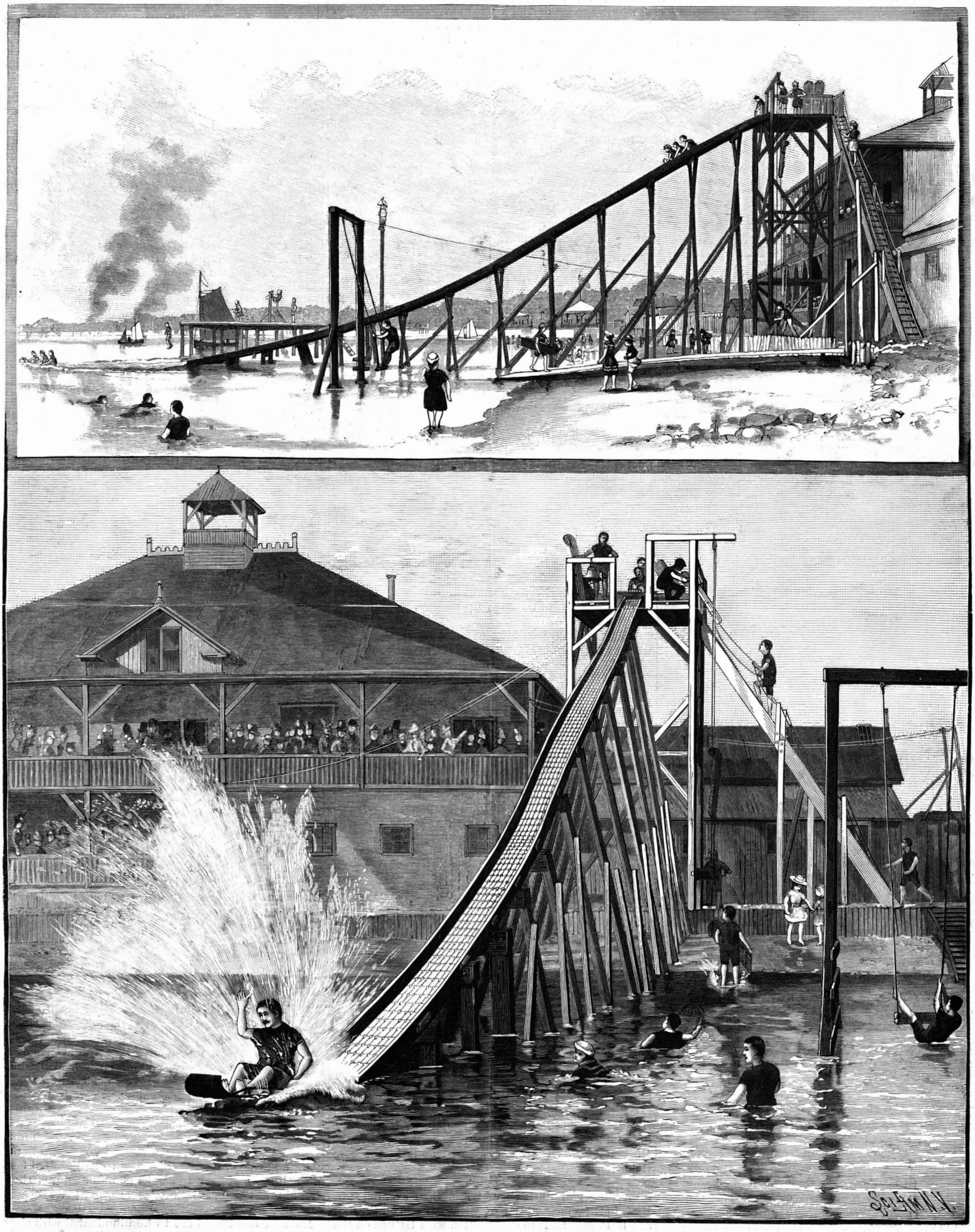
SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyrighted, 1888, by Munn & Co.]

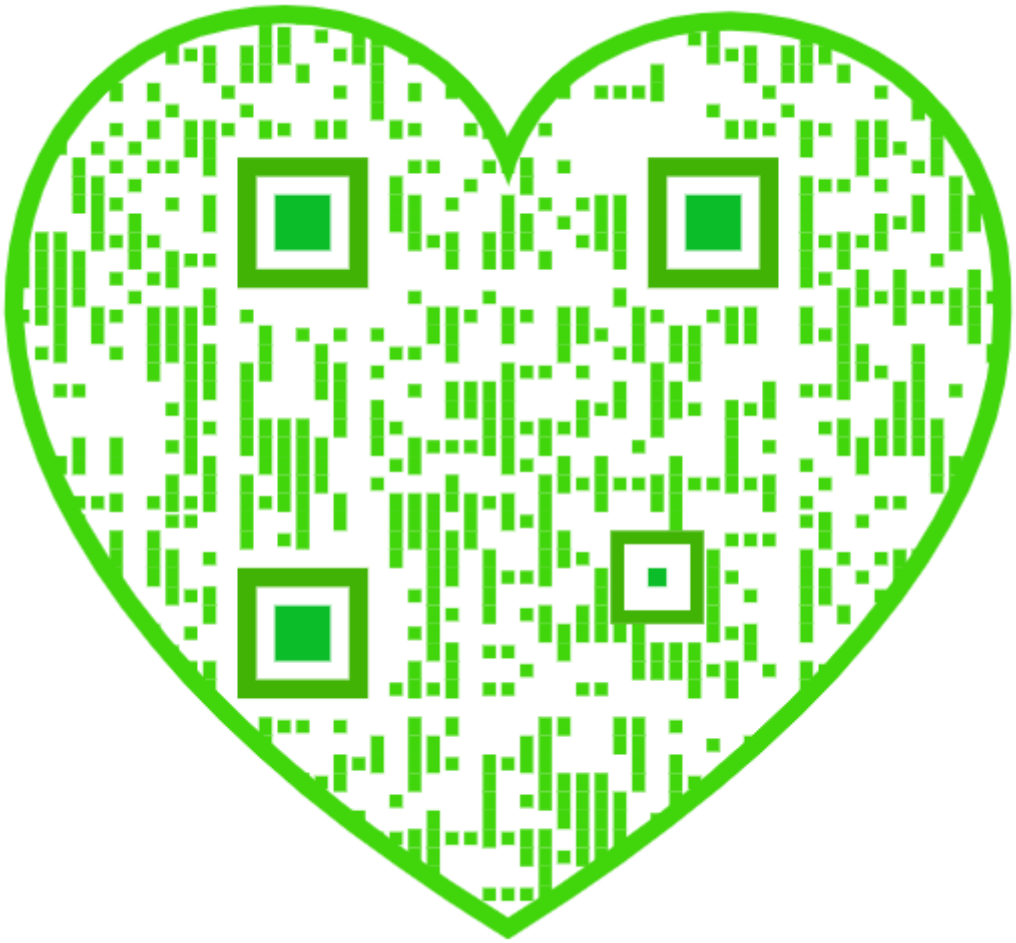
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LIX.—No. 4. [NEW SERIES.] NEW YORK, JULY 28, 1888. [$3.00 per Year.



A MARINE TOBOGGAN SLIDE NEAR BRIDGEPORT, CONN.—[See page 53.]

© 1888 SCIENTIFIC AMERICAN, INC.



Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S. or Canada..... .....$3 00
One copy, six months, for the U. S. or Canada..... 1 50
One copy, one year, to any foreign country belonging to Postal Union, 4 00

Remit by postal or express money order.

Australia and New Zealand.—Those who desire to receive the SCIENTIFIC AMERICAN, for a little over one year, may remit £1 in current Colonial bank notes. Address

MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, for U. S. and Canada. $6.00 a year to foreign countries belonging to the Postal Union. Single copies, 10 cents. Sold by all newsdealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to any address in U. S. or Canada, on receipt of *seven dollars*.

The safest way to remit is by draft, postal order, express money order, or registered letter.

Australia and New Zealand.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for a little over one year on receipt of £2 current Colonial bank notes.

Address MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

NEW YORK, SATURDAY, JULY 28, 1888.

Contents.

(Illustrated articles are marked with an asterisk.)

Absinthe..... 52
Arid region, reclaiming an..... 54
Balloon, vacuum, Congressional.. 51
Biliary secretions, action of medicines on..... 49
Books and publications, new..... 59
Buckthorn in toothache..... 51
Business and personal..... 59
Car coupling, improved*..... 50
Chinese cash..... 49
Clubs, the swinging of*..... 57
Cobra de capello*..... 55
Diet of different people..... 58
Easel with adjustable shelf*..... 51
Electric lighting, the commercial aspect of..... 52
End gate for wagons, improved*.. 51
Filaria, removal of, from a horse's eye..... 56
Globe, a great..... 51
Harmonica holder, improved*.... 51
High speed in thick weather..... 43
Home, summer, care in selecting. 48
Inventions, agricultural..... 59
Inventions, engineering..... 59
Inventions, index of..... 59
Inventions, miscellaneous..... 59
Lighting in France, public, development of..... 52
Lightning, curious doings of..... 56
Marine toboggan slide*..... 47
Mercury, distillation of, at ordinary temperatures..... 54
Meteor, a remarkable..... 53
Metric system, the..... 53
Microscopy..... 56
Mosquito fumigating pastilles.... 58
Noxious gases in houses, to avoid 53
Observatory, naval, at Washington..... 56
Oil, machine and watch, how secured..... 58
Photographic notes..... 49
Physics, experiments in simple*. 55
Planets, position of, in August... 48
Poisoning by a cobra, narrow escape..... 52
Propeller blades, copper coated.. 49
Radio-microphone..... 50
Railway switch stand and signal, improved*..... 50
Rifle, magazine, fire discipline... 52
Roads, country, improving..... 53
Rock drilling machine, improved*54
Russian home industries, increase of..... 56
Ships, Spanish and Italian, built by the English..... 50
Show case, improved*..... 50
Slipping..... 53
Small city on a block..... 54
Spirit level, improved*..... 50
Stove, car, improved*..... 50
Sugar machinery..... 51
Toboggan slide, marine*..... 47, 53
Trees, Central Park..... 53
Viper, spectacled*..... 55
Watches, rock crystal..... 49
Water at and before meals, use of 58

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 656,

For the Week Ending July 28, 1888.

Price 10 cents. For sale by all newsdealers.

PAGE

I. ASTRONOMY.—Stellar Photography.—By EDWARD S. HOLDEN, Director of the Lick Observatory.—Treating of stellar maps, history of astronomical photography, the International Congress, photography at the Lick Observatory, etc..... 10485

II. BIOGRAPHY.—Sir John Pender, K.C.M.G.—His connection with oceanic telegraphy.—Portrait..... 10476

III. CHEMISTRY.—A Simple Form of Apparatus for Generating Gases.—By G. STILLINGFLEET JOHNSON.—1 illustration..... 10485
Determination of Total Solids and Fat in Milk and Butter by Means of Woody Fiber.—By F. GANTTER..... 10485

IV. CIVIL ENGINEERING.—The Panama Ship Canal.—Colon.—The workmen and their habits.—Advantages to commerce of the world.—3 illustrations..... 10471
Timber and Some of its Diseases.—By H. MARSHALL WARD.—Part VII. of a long and valuable article.—Several illustrations..... 10473

V. ELECTRICITY AND TELEGRAPHY.—The Minimum Point of Change of Potential of a Voltaic Couple.—By Dr. G. GORE, F.R.S.. 10476
Effect of Chlorine on the Electro-motive Force of a Voltaic Couple.—By G. GORE..... 10476
Electrical Barometer.—Johnson Stephen's apparatus.—1 illustration..... 10476
Combined Morse Ink Writer and Sounder.—3 illustrations..... 10477

VI. GEOGRAPHY AND EXPLORATION.—Six Weeks in Southern Mindanao.—By J. B. STEERE.—Treating of the methods of obtaining birds, etc..... 10484
The River Doce, Brazil.—Its source, banks, inhabitants of the country, etc..... 10484

VII. MECHANICAL ENGINEERING.—History of the Hardie Compressed Air Locomotive.—Workings of a paper stock company.—Suggested improvements in the Mekarski car..... 10472
A New Fluviatile Motor.—With description and illustration..... 10472

VIII. MINING.—Mica Mining in North Carolina.—By WM. B. PHILLIPS.—Conclusion of this interesting article, describing the process of dressing "block" mica, and giving some statistics..... 10474
Notes on the Rock Salt Mines of Petite Anse, Louisiana.—By H. CARRINGTON BOLTON.—Abstract of an interesting paper read before the New York Academy of Sciences..... 10475

IX. MISCELLANEOUS.—Dr. Vettin's Wind Vane..... 10482
Cremation from a Sanitary and Sentimental Point.—The soil of cemeteries.—What cremation is..... 10482
Hundredth Anniversary of the Linnean Society, London.—Account of the meeting held May 24, at Burlington House..... 10485

X. PHYSICS.—Intensities of Light.—Dr. Koenig's experiments with the spectrum..... 10477
Standards of Light.—Abstract from paper by Mr. W. J. DIBDIN. 10477

XI. SURGERY AND MEDICINE.—Electric Acupuncture—Acupuncture as practiced by the Chinese.—The needles used.—Introduction into Europe.—Use of electricity.—6 illustrations..... 10483
Transplantation of Nerve from the Rabbit to Man.—A detailed description of Dr. Gersung's novel operation..... 10483

XII. TECHNOLOGY.—Photo-Zincograph Engravings.—Process and apparatus used by Mr. JOHN SWAIN.—4 illustrations..... 10478
The Manufacture of Hydrogen.—Primitive methods of generating the gas for use in balloons.—Modern plants.—3 illustrations.... 10479
The Manufacture of Glass.—The art known to the ancients.—Description of a modern glass factory, and operations performed therein..... 10480

HIGH SPEED IN THICK WEATHER.

The steamer Fulda, of the North German Lloyd line, which arrived early last week, was reported by some of her passengers to have cut down a fishing schooner while crossing the Grand Banks in a fog. They said they saw the boat sinking, heard the despairing cries of her crew, and condemned in unmeasured terms the heartlessness of running so fast in a region where so many fishermen are known to congregate. The report of the Fulda's master says that the ship was running only at half speed, that she did not sink the fisherman, but admits carrying away the bowsprit and foremast. Whether or no the Fulda sunk the fisherman, the fact remains that most of the fast steamers, there is reason to believe all of them, of whatever line, are wont to run at reckless speed in thick weather. The testimony of innumerable witnesses vouches for it; the records of the ships themselves confirms it. Indeed, the masters of the best of them have, in a recent publication, fairly admitted over their own signatures that this is the practice, seeking to condone it on the ground of safety to their own ships.

In the present instance, what facts have come to light show that the Fulda was going at such a rate of speed that she could not avoid striking the fisherman. This being the case, it does not matter whether she was running at half or full speed—she was going too fast. The rules of the road at sea do not say, as one might gather from the master's report, that a steamer may run at half speed in a fog regardless of consequences. They distinctly require a steamer to slow up when in the presence of other craft, or where they are likely to be found; indeed, to stop her engines frequently, lie by, and sounding her whistle wait for a response. Clearly, if the master of the Fulda had done this, there was strong chance he would have heard the fog horn of the ill-fated fisherman in time to avoid a meeting, for every one of these keep their fog horns going while lying in the fog.

Over two thousand fishing schooners frequent these banks; they come from our own coast, Nova Scotia, Prince Edward Island, Cape Breton, New Brunswick, Newfoundland, and three little French islands on the southwestern coast of Newfoundland—Miquelon, St. Pierre, and Isle aux Chiens. The boat struck by the Fulda was evidently from one of these latter. Indeed, a dispatch says that the Jeune Edouard was cut down by a steamer on the 14th. Portions of this great fleet are always anchored or hove to directly in the path of the transatlantic steamers, and not a season passes that more or less of them are not cut down by the merciless prows of these ocean greyhounds. Rarely it is that anything is ever heard of these catastrophes—for it is at night when they are most frequent; and they will tell you in the fishing towns that a big iron steamer can cut down a fisherman without awaking its passengers. The howling winds and turmoil of waters drown the cries of the men struggling in the water, and the bereaved ones on the Gloucester hills or the Canadian cliffs watch long and vainly for those who will never return.

POSITION OF THE PLANETS IN AUGUST.

JUPITER

is evening star. He is in quadrature with the sun on the 20th at 3 h. A. M., being at that time 90° east of the sun and most favorably situated for observation. Jupiter in quadrature is on the meridian at sunset, and looks superbly in his elevated position as he travels on his westward path, the largest and most brilliant star among the myriads that stud the sky. He is approaching Beta Scorpii in his eastward progress, as any observer may see who marks his path among the bright stars of Scorpio. Jupiter sets on the 1st at 11 h. 40 m. P. M. On the 31st, he sets at 9 h. 48 m. P. M. His diameter on the 1st is 37″.8, and he is in the constellation Libra.

SATURN

is morning star with the exception of a few hours of the 1st, when he still ranks among the evening stars. He is in conjunction with the sun on the 1st at 8 h. P. M., when he rises and sets with the sun, passing to his western side and becoming morning star. He is invisible during the larger part of the month on account of his nearness to the sun. On the 31st, however, he rises two hours before the sun, and sharp-sighted observers may find him 9° north of the sunrise point. Saturn sets on the 1st at 7 h. 14 m. P. M. On the 31st, he rises at 3 h. 13 m. A. M. His diameter on the 1st is 15″.4, and he is in the constellation Cancer.

NEPTUNE

is morning star. He is in quadrature with the sun on the 24th, at 10 h. P. M., being 90° west of him, and rising about midnight. Neptune rises on the 1st at 1 h. 59 m. A. M. On the 31st, he rises at 0 h. 4 m. A. M. His diameter on the 1st is 2″.6, and he is in the constellation Taurus.

MERCURY

is morning star until the 23d, and then evening star. He is in superior conjunction with the sun on the 23d, at 8 h. P. M. He is in conjunction with Saturn on the 13th, at 11 h. P. M., being 39′ north. Mercury rises on the 1st at 3 h. 24 m. A. M. On the 31st, he sets at 6 h. 50 m. P. M. His diameter on the 1st is 6″.8, and he is in the constellation Cancer.

MARS

is evening star. The ruddy planet glows with decreasing luster, as easily visible in the southwest. In the early evening, he recedes from Spica and approaches Jupiter. Mars sets on the 1st at 10 h. 30 m. P. M. On the 31st, he sets at 9 h. 21 m. P. M. The diameter of Mars on the 1st is 9″.0, and he is in the constellation Virgo.

URANUS

is evening star. He sets on the 1st at 9 h. 47 m. P. M. On the 31st, he sets at 7 h. 52 m. P. M. His diameter on the 1st is 3″.5, and he is in the constellation Virgo.

VENUS

is evening star. She is still close to the sun, setting on the 31st only half an hour later than the sun. Venus sets on the 1st at 7 h. 33 m. P. M. On the 31st, she sets at 7 h. 4 m. P. M. Her diameter on the 1st is 10″.0, and she is in the constellation Cancer.

Mercury, Venus, Uranus, Mars, and Jupiter are evening stars at the close of the month. Saturn and Neptune are morning stars.

Care in Selecting the Summer Home.

The importance of examining closely the plumbing, the cellar, the kitchen, and the water supply cannot be overestimated. A reporter on the *Mail and Express* heard a prominent physician a few days ago deprecating in strong terms the little care which is too often exercised by people in their choice of a summer resort, and, in the course of his conversation, said:

"It seems to me that parents exercise little judgment either for their own good or for that of their children in this matter. In too many instances their selection is so bad that it would be much better for all concerned if they had remained in their city houses. The number of deaths which occur among families during their absence from home in the summer, especially among children, is positively appalling when taken in the aggregate, and in the majority of cases these deaths are due solely to the unhealthfulness of the places which have been chosen.

"It would be advisable, if possible, for one of the members of the family to make a personal examination of the surroundings of the house or locality proposed for a resting place before the time for departure arrives, and this can be readily accomplished when its distance from the city is not great, as in the towns within a radius of forty or fifty miles.

"One of the worst features of the ordinary country hotel or boarding house is its plumbing, for generally there is none at all or next to none, and where the plumbing is bad, there disease is sure to come sooner or later.

"Especial attention should be directed to the water supply, and a careful scrutiny of its source should be made. If it comes from a spring near the house, the presumption is that the water will be clear and pure, but if, on the contrary, it is discovered that it comes from a running stream, it would be advantageous to investigate the course of the stream, to see that the water is not likely to suffer from any impurities upon its banks. The location of the well and cesspools should also be learned, for if these are not separated from each other by a distance of seventy or eighty yards, it is possible for the former to be contaminated by the latter, especially when the soil is light and porous.

"Watch closely for signs of filthiness in the neighborhood of the house, for if the refuse from the kitchen is carelessly thrown upon the ground to bake and boil in the sun, it is almost certain that disease will be the result.

"In the selection of a summer home, choose one that is not completely enveloped in shade, for it will surely prove to be damp and unhealthy. Do not take a room on the ground floor, if it is possible to avoid it, unless it is certain that the cellar underneath is perfectly dry, and do not stay longer in dark rooms than is necessary."

Apropos to the above, the Iowa State Board of Health, in its monthly bulletin for June, has the following:

"Said a father who was returning from a summer resort, where he buried four lovely children, who died of diphtheria, the result of defective drainage and polluted water: 'That hotel keeper is as guilty of murder of my children as if he had shot them with a revolver.' As a matter of justice, the father was right, but in law, probably not. But, adds the health board, the law ought to be such as to hold the keeper of a hotel or public resort responsible for the healthy condition of his premises, and liable for neglect to provide pure air and water for his guests. Patrons of these places should take with them an ounce vial of saturated solution of permanganate of potash, and test the water by putting half a dozen drops of the potash in a tumbler of it. If the water turns dark or brown in an hour, and they find cesspools within one hundred feet of the house and near the wells or water supply, they should take the first train for some other place."

LONDON omnibuses are to be illuminated with electricity, the battery to be under the seat of the driver.

© 1888 SCIENTIFIC AMERICAN, INC.

PHOTOGRAPHIC NOTES.

Photograph of Lightning. — From A. H. Binden, Wakefield, Mass., we have received a superb 6½×8½ photograph of lightning, taken quite recently during a severe thunder storm, between eight and nine o'clock in the evening.

The exquisite detail in the fine branch-like flashes is especially noticeable, while the illumination of the clouds and landscape is also remarkable. As many as four principal bolts are seen in the picture.

Hydroxylamine and Pyro. Developer.—In a paper read before the Photographic Society of Philadelphia, reported in the *American Journal of Photography* by Dr. Charles L. Mitchell, the following formula is given:

No. 1.

Hydroxylamine chloride	30 grains.
Pyrogallol	240 "
Water	16 ounces.

No. 2.

Sodium carbonate (crystals)	1½ Troy ounces.
Sodium sulphite "	4½ " "
Water	16 ounces.

To develop, take of No. 1 from one to two fluid ounces, No. 2 one half fluid ounce, water four ounces; flow over the plate, and if the image does not appear within thirty or forty seconds, add more of No. 2 solution in small portions at a time, until development commences.

I have developed a dozen lantern slides, using the same developer for all, and after the last plate was finished, the developer was but of a moderately light orange color. The mixture of the pyro. and the hydroxylamine chloride seems to possess remarkable keeping qualities. As a general rule, pyro. mixtures should be stored in yellow or amber colored glass bottles provided with rubber corks, as the amber color prevents the actinic light from penetrating to the contents of the bottle. The developer is very superior for negatives, giving clear shadows free from stain. Hydroxylamine, though a somewhat new article in photography, can be had from the largest dealers and manufacturers in photographic materials.

A Safe Reducer.—It frequently happens that negatives, by prolonged development or by the addition of too much pyro. to the developer, become too dense in the high lights, and thereby obscure detail. Farmer's solution of ferricyanide of potassium and hyposulphite of soda is generally recommended, but unless the plates are carefully washed, a tendency of the negative to turn yellow is sometimes observed.

In a communication to the photographers' annual convention, held in Minneapolis, Minn., in July, Charles Ehrmann advises the use of potassio-ferric oxalate combined with a small quantity of hypo. We quote from the *Photographic Times* the formula and remarks concerning it: "Potassio-ferric oxalate is sensitive to light, and must therefore be kept in the dark. It has a peculiar green color, which oxidizes to a brown if the crystals are exposed much to light. The formula for reducing is simply to take 10 parts of the potassio-ferric oxalate in weight, previously dissolved in as little water as possible, and add it to 100 parts of ordinary hypo. solution, such as is used in fixing out plates. When an over-intense negative is subjected to this compound, the reduction will take place slowly, but perceptibly, and the process can, therefore, be easily controlled. Unless the hypo. is combined with the green salt, no reduction will occur. Hence it will be apparent that it will not be necessary to wash a negative after fixing, provided it is to be reduced.

Photographers' Convention.—The annual convention of the Photographers' Association of America was held in Minneapolis, Minn., from July 10 to 14, and was largely attended by Western photographers, about four hundred being present.

Several interesting papers pertaining to photographic subjects were read, and there was a large display of photographs. H. McMicheal, of Buffalo, was elected president for the next year, and it was voted to hold the next convention in Boston, Mass.

Eder's Orthochromatic Wet Collodion Process.—According to H. E. Gunther, whose account of the latest process by Dr. Eder we find reported in the *Photographic News*, plates sensitized as directed produce most beautiful results. He says: "Though its sensitiveness is about ten to twenty times less than that of collodion emulsion, the exposure required varies between a few minutes and a quarter of an hour in the case of oil paintings. Also, by this process, the various colors are reproduced in their true values without a yellow screen being required. The process is the following: Eosine collodion. In 140 c. c. of alcohol (of 40°) 0·6 gramme of eosine (yellow stain), and 12 grammes of cadmium bromide are dissolved and filtered, and 70 c. c. of this solution are mixed with 100 c. c. of 2 per cent plain collodion. The glass plate is coated round the edges with India rubber solution, then the collodion is poured on. After the first coating has settled, another coating of collodion should be applied, this time pouring it on at the opposite corner of the plate. The film having settled, the plate is sensitized in a strong silver bath. The first bath consists of 100 grammes of silver nitrate, 500 c. c. of water, and 2 to 3 drops of concentrated nitric acid. The plate is left in this bath for five to seven minutes, when it is immediately placed in another sensitizing bath consisting of 10 grains of silver nitrate and 500 c. c. of water, in which the plate is left for one to two minutes. In this way the unclean portions of first sensitizing bath left in the film are washed away, the weak solution preventing, in the case of longer exposures, the silver nitrate from becoming dry and crystallized. The exposure will take about five to eight times longer than is required in the old wet collodio-iodide process. The developer consists of a solution of 10 grammes of iron sulphate in 100 c. c. of water, to which 2 to 4 drops of concentrated sulphuric acid are added. The picture comes out rapidly, and the development has to be carefully controlled. The negative is fixed with hypo. The picture, appearing somewhat flat at first, afterward becomes clear and brilliant. The reddish color remaining in the film can be eliminated by application of diluted alcohol and rinsing with water. Intensification is effected with the well known mixture of pyro, citric acid, and silver nitrate, reduction by potassium ferricyanide with hypo, or by bichloride of mercury with potasium cyanide."

Toning Gelatino-Chloride Emulsion Prints.—Reported in the same journal by Mr. Gunther is a description of Obernetter's toning process for this improved paper, as follows: The prints must be a little overprinted, still more than albumen prints, because they are considerably reduced in the fixing bath. They are placed with the film side upward in the washing bath, and after having been washed out for five to ten minutes, they are taken out, and put into the toning solution. This consists of:

Gold and sodium chloride	1 gramme.
Distilled water	600 c. c.
Powdered chalk	50 grammes.

One hour before use the gold solution is shaken up, then allowed to settle, and then filtered into the dish. It is then ready for use. After it has been employed, it is poured back into the stock solution bottle. In this bath the prints are left until the yellowish color which by transmitted light may be seen in the light parts of the picture has disappeared, and a slightly reddish violet color appears in the half tones. Then the prints are washed out for a short period, placed in the alum bath, washed out once more, and placed for fifteen minutes in the fixing solutions (1 : 20); in this bath the prints will lose their violet color, and become reddish brown or brownish, according to the previous mode of toning. If the prints are then washed out and dried, that warm photographic tone will appear which, according to the duration of the action of the toning bath, will vary from brownish violet to purple and gray. If a fresh, strong, gold solution is used, the toning will be completed within twenty to thirty seconds. In this manner fifty prints of the size of 11 by 15 inches can be toned with only one gramme of gold and sodium chloride without exhausting the gold bath. Comparative experiments have shown that in using the toning bath recommended by Obernetter, almost four times as much gold chloride is required to obtain the same color tones, and that even the toning of albumen prints requires more gold chloride than this process. Prints which have been toned for too short a period, and which, therefore, have retained a brownish color, may be toned further after fixing in the bath itself, if a little red prussiate of potash is added to it until it turns yellow. After one to two minutes the print is taken out, washed out, placed into the alum bath, and then washed out. The alum bath consists of a cold saturated alum solution to which a little citric acid is added. As a rule, the prints will tone the quicker, the shorter they have before been washed out; on the other hand, the toning process can be better controlled if it proceeds slower. Therefore, the mid way will be the best. After a few experiments, it will be very easy to obtain the tone required by this method.

Copper-Coated Propeller Blades.

At the last meeting of the Institute of Naval Architects, Mr. W. C. Wallace read a paper on "The Material Best Suited for Propeller Blades." A discussion ensued, in which the great amount of corrosion and pitting in cast steel propeller blades was particularly emphasized. This discussion attracted great attention in the Sheffield district, and several steel manufacturers set to making experiments. At Attercliffe there are steel works known as the "Specialty," which belong to Messrs. John Willis & Co. Mr. Willis, the principal, was among those whose interest was excited by the discussion. The outcome of his study and experiments is a new method of preserving iron and steel propellers, blades, etc., from corrosion. This invention consists in a coating of copper united to the casting, this being effected by the copper plate properly bent in shape being placed in and forming part of the mould, into which the iron or steel is then poured, with the result that the copper is said to be firmly united by fusion to the iron or steel face. The invention applies to all anti-corrosive metals, several of which are now undergoing tests to ascertain the most suitable for this purpose. Several blades, with the backs protected by a copper coating on Mr. Willis' system, are in course of manufacture in Sheffield.

Rock Crystal Watches.

A new and peculiar class of timepieces has lately been brought out by the Waltham Watch Company which illustrates the steady progress that is being made in the arts of skill and precision. This is a watch of ordinary size, of which the case and plates are made of Brazilian pebble or rock crystal, thus rendering the watch transparent, and exposing to plain view the wheels and all other parts of the interior mechanism. Watches of this kind are now kept in regular stock by the Waltham company, and as timekeepers they possess the usual superior excellence for which all Waltham watches are now celebrated.

The rock crystal watch is, we understand, the result of the especial skill and genius of Mr. Wm. R. Wills, who for the past thirty-one years has had charge of the jeweling department of the Waltham Watch Company. He has discovered a new and rapid mode of cutting crystals and gems of all kinds, by which the lapidary's art is greatly facilitated. Operations heretofore requiring two months' time are now reduced to two hours. Mr. Wills seems to have learned how to carve, cut, and bore the hardest stones with as much facility, certainty, and precision as if the materials were so much brass. He will, for example, take a six inch block of pebble, and in a couple of hours cut it into sheets of any desired thickness; or from the same block cut out the center of the casing or solid ring for a watch case. We lately examined one of these new rock crystal watches.

The center of the case is of rock crystal, in one piece. It is bored for the stem and stem winder, which is secured therein by clamping screws. It is also bored for the push pin by which the winding and setting mechanism is operated. The two plates of the watch, between which the wheels rotate, are made of rock crystal. The pivots of the balance bridge, pallet bridge, the center wheel, and third wheel, the fourth wheel, and the escape wheel are set in rubies, and these rubies are set in sapphires, which latter are set in the crystal plates, these settings being secured to the plates by friction. There are in all twelve sapphire settings, each carrying a ruby setting. The pivots of the barrel and crown wheel run in the crystal plates. The plates are held apart by sapphire pillars, through which screws pass. The balance cock and pallet bridge are of rock crystal, the push pin is of chrysolite. For the various screws and settings there are 38 holes drilled in the crystal plates.

The dial is made in the form of a skeleton of gold. Above each hour mark is a diamond, and between the diamonds there is a ruby for each minute. The diameter of the rock crystal plates is 1⅞ inches. The front and back of the case is composed of a crystal plate. Thus constructed, the watch is transparent, and may be used as a slide for a magic lantern. Altogether, it is a unique and attractive article.

Another of the watches which we examined had its front plate made of red agate, and presented a very beautiful appearance.

Action of Medicines on the Biliary Secretion.

A number of experiments as to the action of medicines on the biliary secretion have been made by Messrs. Prevost and Binet, chiefly upon dogs (*Compt. Rend.*). They found that bile itself, taken internally, is the most powerful cholagogue. Other substances acting as cholagogues are oil of turpentine and its derivatives terpinol and terpine, chlorate of potassium, benzoate and salicylate of sodium, salol, euonymin, and muscarine in subcutaneous injection. Some other substances which are generally considered to be cholagogues are classed by these experimentalists in a separate group, the action of which is slight, doubtful, or uncertain, as bicarbonate, chloride, and sulphate of sodium, Carlsbad salt, aloes, cathartic acid, rhubarb, boldo, hydrastis, ipecacuanha, propylamine, and antipyrin. The following substances were found by them to cause a diminution of bile, viz., iodide of potassium, calomel, iron, and copper, atropine subcutaneously injected, and strychnine in a toxic dose. The drugs found to be without action on the biliary secretion were phosphate of sodium, bromide of potassium, chloride of lithium, corrosive sublimate, arsenate of sodium, alcohol, ether, glycerine, quinine, caffeine, pilocarpine, kairin, cytisine, senna, and calumba.

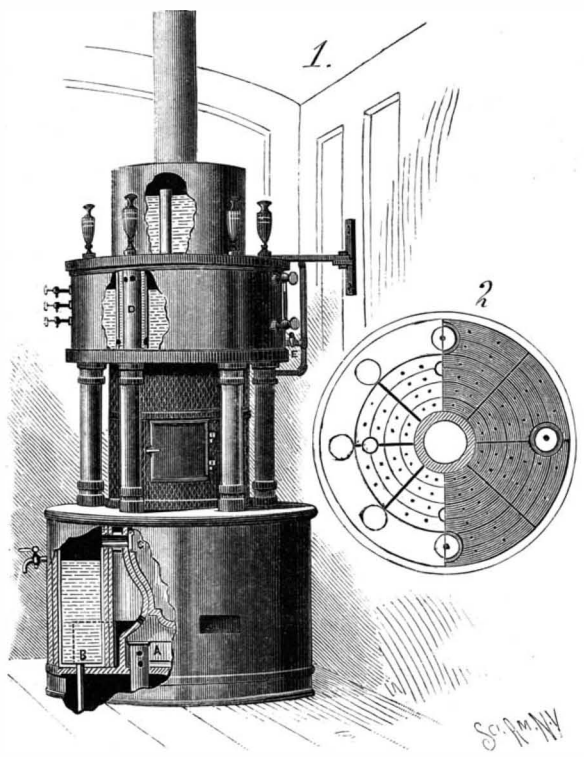
Chinese Cash.

A large number are engaged in moulding, casting, and finishing the "cash" used as coin all over China—Mexican dollars and Sycee silver being used in large transactions. The cash are made from an alloy of copper and zinc, nearly the same as the well known Muntz metal; and it takes about 1,000 of them to answer as change for a dollar, so minute and low do prices run in this country, of which I will only give one instance. The fare for crossing the ferry on the Peiho was only two cash, or one-fifth of a cent.

© 1888 SCIENTIFIC AMERICAN, INC.

AN IMPROVED CAR STOVE.

A stove for heating railway cars, provided with appliances for extinguishing the fire in case of accident or of the extraordinary tipping of the car, has been patented by Mr. William P. Wheeler, of No. 814 West Madison Street, Louisville, Ky., and is illustrated herewith, Fig. 2 being a sectional view through the two upper annular water reservoirs. Within two annular plates on the base plate is a water reservoir surrounding the fire pot, under which air tubes, A, pass through the car floor, a pipe, B, from the reservoir providing for drainage when desirable. Heat-insulating material is placed between the reservoir and its surrounding plates, and the reservoir is divided perpendicularly by perforated partitions and horizontally by perforated shelves. To the top of the stove wall is fitted a ring which supports a second annular water reservoir, and pipes, D, extending through it, communicate with the reservoir below, these pipes surrounding long bolts which securely bind together the two reservoirs and the stove. Between the upper part of the lower reservoir and the fire pot, at A, are short tubes, with an automatic valve over the mouth of each, capable of opening by a slight pressure of water and closing by its own gravity, and the pipes, D, also communicate with these tubes. In the second reservoir each pipe, D, has a surrounding pipe, the inner and outer pipes forming

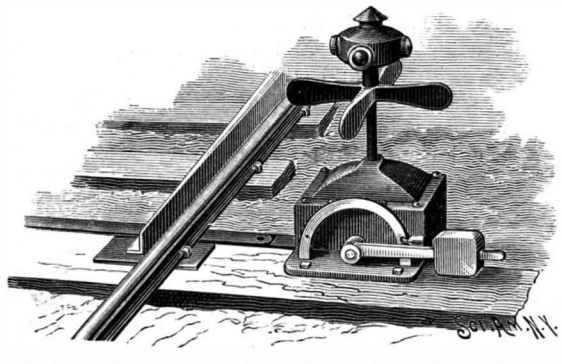


WHEELER'S CAR STOVE.

a siphon adapted to draw water from the reservoir when the stove is unduly inclined to one side, as by an accident or collision, when both reservoirs will be discharged into the fire pot at A. When the water is exhausted in these two reservoirs, by evaporation or otherwise, it is replenished from the upper reservoir by opening a valve provided for such purpose. The second reservoir has try-cocks at different heights, and a water gauge to determine the level of the water, and the two upper reservoirs have wave arresters to prevent undue movement of the water when the stove is in its normal condition.

IMPROVED RAILWAY SWITCH STAND AND SIGNAL.

An improved switch stand, in which the signal is automatically changed as the switch is moved, has been patented by Mr. Nathaniel W. Boyd, of Steelton, Pa., and is illustrated herewith, as applied to a point or split switch, a different application of the improvement having been illustrated by us in a former number. The principal operative portions are inclosed in a metal case, to exclude dirt, snow, ice, etc., there being spaced ribs in the bottom of the casing, and a

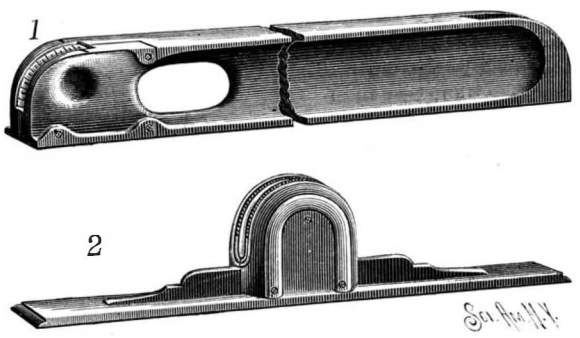


BOYD'S RAILWAY SWITCH STAND AND SIGNAL.

friction roller, upon which slides a rack bar projecting through slots in the casing and connected with the switch bar, which extends under the main rail to the switch points. The stand is mounted directly upon a single tie or sleeper, and may be set up on either side of the track, a half revolution of the lever giving the signal shaft a quarter turn, whereby the different colored sides of the lantern or wings of the semaphore are displayed.

AN IMPROVED SPIRIT LEVEL.

A level designed to be in condition at all times to indicate a level or plumb, or any required angle, without



HUTTON'S SPIRIT LEVEL.

the manipulation of set screws, etc., and wherein the vial is so set as to be absolutely protected against hard usage, has been patented by Mr. James C. Hutton, and is illustrated herewith, two forms of construction being shown. The ends of the main frame, in which the vials are set, as represented in Fig. 1, are divided into two sections, one of which is detachable, the fixed section having a circular recess, a segment of which is countersunk for the reception of a bed of plaster of Paris to receive a vial case. The latter is circular, and made in sections, with a segmental depression and central aperture for a pivotal screw, by which the vial case may be revolved when it is placed between the case sections, to bring it in proper position between the plumb and level marks on the top and end edge of the frame, there being degree marks upon the surface between these points. The vial case, as well as the case sections, provide for the thorough and accurate embedding of the vial in plaster of Paris, whereby a strong, durable, and immovable setting is obtained. For greater convenience in some kinds of work, Fig. 2 shows a construction in which the vial is located centrally, and in which the bead may be seen from either side. The vials used may describe a true half circle, or be made more or less of a horseshoe form. In this kind of level, no matter what the inclination or how the instrument is placed, the degrees may be readily observed and the bead seen.

For further information relative to this invention address Mr. James C. Hutton, of Corvallis, Oregon, or Mr. Patrick J. McElroy, of East Cambridge, Mass.

Spanish and Italian Ships Built by the English.

The three new cruisers for the Spanish government are to be built at Bilbao by the Barrow Shipbuilding Company, which has started a branch establishment at that place. The Spanish government insisted upon building the vessels in Spain, and this will now be accomplished; but they will not be built by Spaniards all the same. The Barrow Company is now designated "The Naval Construction and Armament Company, Limited," and will undertake the manufacture of ordnance as well as the construction of war ships. It is worthy of remark that although these cruisers, which are to be very powerful and steam at a high rate of speed, are to be built at Bilbao in Spain, yet the whole of the machinery, boilers, torpedo boats, Whitworth and Nordenfelt guns, are to be supplied from Barrow.

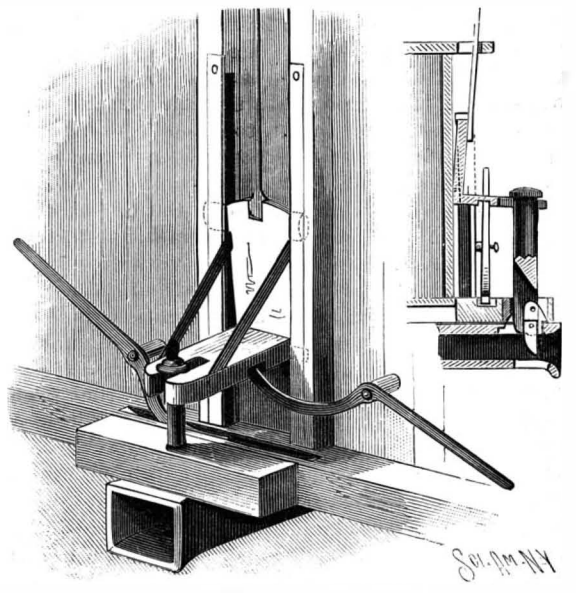
The Italian government are adopting a similar course in regard to the construction of steam machinery for their monster armorclads. Having determined to make their engines and boilers at home, their intentions are fulfilled by intrusting the contract to a branch, established at Naples, of the Tyneside firm of Hawthorn, Leslie & Co., under the name of the "Societa Hawthorn-Guppy." This branch of the Newcastle firm are now making twin screw engines of 23,000 horse power for the armorclad Sardeque; but in this case also, the design and all the principal castings and forgings are being supplied from the parent establishment in this country.—*Broad Arrow.*

The Radio-Microphone.

Mr. C. Vernon Boys has described before the Royal Society an instrument for measuring very small changes of temperature. "It is an extremely delicate form of thermopile, consisting of a square frame made of one turn of one square centimeter, of which three sides are thin copper wire, and the fourth is a compound bar of antimony and bismuth, each piece being $5 \times 5 \times \frac{1}{6}$ mm., soldered edge to edge. This frame is supported by a thin rod to which is fastened a mirror, and the whole is hung by a torsion fiber in the field of a powerful magnet. When radiant energy falls on the center of the compound bar, the frame is deflected, and the amount of deflection measures the energy. Adopting suitable dimensions, and using a very strong field, an instrument may be made capable of showing a change of temperature of the junction of one thousand-millionth of a degree."

AN IMPROVED CAR COUPLING.

A car coupling designed especially for use in connection with freight cars, and in which the parts are so arranged that the cars may be coupled or uncoupled from the sides or top, has been patented by Mr. Samuel Byrne, of No. 158 Robert Street, Toronto, Canada, and is illustrated herewith, the small figure showing a central longitudinal section of the coupling. The end of the car is provided with vertical ways, in the grooves of which is mounted a slide having upper and lower guiding lugs, the slide carrying on its lower end an outwardly extending plate, slotted to receive the shank of the coupling pin and transversely grooved to receive the lower ends of levers loosely mounted upon studs at either side. The ways are formed with recesses adapted to receive the lower guiding lugs of the slide when it is lifted by either of the levers at the side, as shown in the perspective view, to maintain the pin in raised position, the handle of the lever, as it is thrown downward in moving the slide, being also moved outward from the car body. The lower end of the coupling pin is also provided with a gravity catch, engaging a shoulder of the drawhead, to be used in arranging the coupler for coupling cars automatically, the slide being then lowered sufficiently for such purpose, when a link within the drawhead may be pulled out, but an entering link will cause the pin to drop and engage such

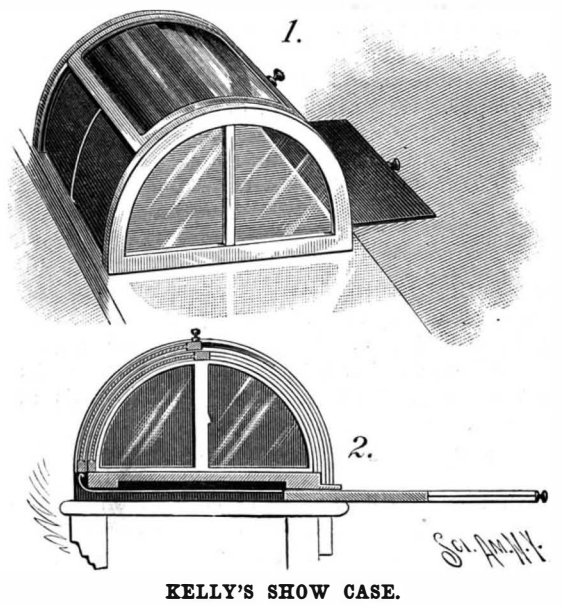


BYRNE'S CAR COUPLING.

link. A handle extends upward, whereby the slide may be operated from the top of the car, as well as by the levers at the sides.

AN IMPROVED SHOW CASE.

A show case having a shelf operating in connection with a sliding cover, and designed to be strong, durable, and attractive, has been patented by Mr. James J. Kelly, of No. 130 Lark Street, Albany, N. Y., and is illustrated herewith, Fig. 2 representing a central transverse section of the show case and shelf. The body of the case is segmental in contour, having an inner fixed bottom and an outer bottom which may be conveniently attached or detached to facilitate cleaning. The outer bottom is recessed, and has grooved side walls, to receive a shelf with tongued ends sliding in the grooves, while a half cover is rigidly secured in the segmental end pieces of the frame. The end pieces project beyond this cover, and in the extended portion are grooved to receive a sliding half cover, both covers being adapted to hold frames of



KELLY'S SHOW CASE.

glass. Centrally to the rear of the sliding cover is attached a cord or chain, which extends downward in a transverse groove upon the fixed cover, and is secured at the other end to the rear of the sliding shelf, so that when the cover is drawn out the sliding cover is raised, and when the cover is closed the shelf is drawn in.

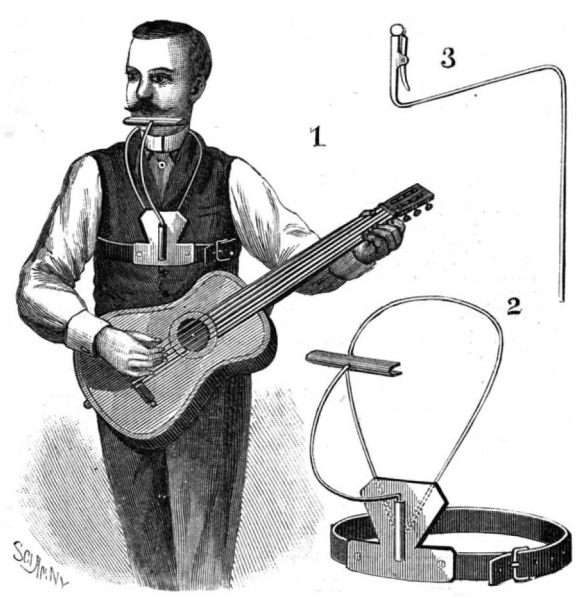
© 1888 SCIENTIFIC AMERICAN, INC.

The Congressional Vacuum Balloon.

The committee of the House of Representatives on acoustics and ventilation has actually reported favorably a bill appropriating $75,000 to subsidize a man who thinks he can construct a steel "vacuum" balloon of great power. He is to be allowed to use the facilities of one of the navy yards for the building of his machine, and is to have the money as soon as he has expended $75,000 of private capital upon his air ship. One of the mathematical physicists of Washington was asked by a member of Congress whether such a balloon could be successfully floated. He set to work upon the problem, and here are some of his results, which are rather curious: A common balloon is filled with hydrogen gas, which, being lighter than air, causes the balloon to rise and take up a load with it. But, as the pressure of the gas within is equal to the pressure of the atmosphere without, no provision other than a moderately strong silk bag is required to prevent collapse. The inventor of the proposed steel balloon hopes to gain greater lifting power by using a vacuum instead of gas, the absence of substance of any kind being lighter than even hydrogen gas. But he has to contend with the tendency of the shell to collapse from the enormous pressure of the atmosphere on the outside, which would not be counterbalanced by anything inside of it. The first question which presented itself was, How thick could the metal of the shell be made, so that the buoyancy of the sphere, which would be the most economical and the strongest form in which it could be constructed, would just float it without lifting any load? The computations showed that the thickness of the metal might be 0·000055 of the radius of the shell. For example: if the spherical shell was 100 feet in diameter, the thickness of the metal composing it could not be more than one-thirtieth of an inch, provided it had no braces. If it was thicker, it would be too heavy to float. Now, if it had no tendency to buckle, which of course it would, the strength of the steel would have to be equivalent to a resistance of more than 130,000 pounds to the square inch to resist absolute crushing from the pressure of the air on a cross section of the metal. Steel of such high crushing strength is not ductile, and cannot be made into such a shell. If the balloon is to be braced inside, as the inventor suggests, just as much metal as would be used in constructing the braces would have to be subtracted from the thickness of that composing the shell. Of course, such a shell would buckle long before the thickness of the metal of which it was composed was reduced to 0·000055 of its radius. In other words, it is mathematically demonstrated that no steel vacuum balloon could be constructed which could raise even its own weight. This is an illustration of how intelligently Congress would be likely to legislate on scientific matters unguided by intelligent scientific advice.—*Science.*

AN IMPROVED HARMONICA HOLDER.

A holder in which a clamp or catch for a harmonica or similar instrument is mounted on a support, with means for attaching it to the body of the musician, is

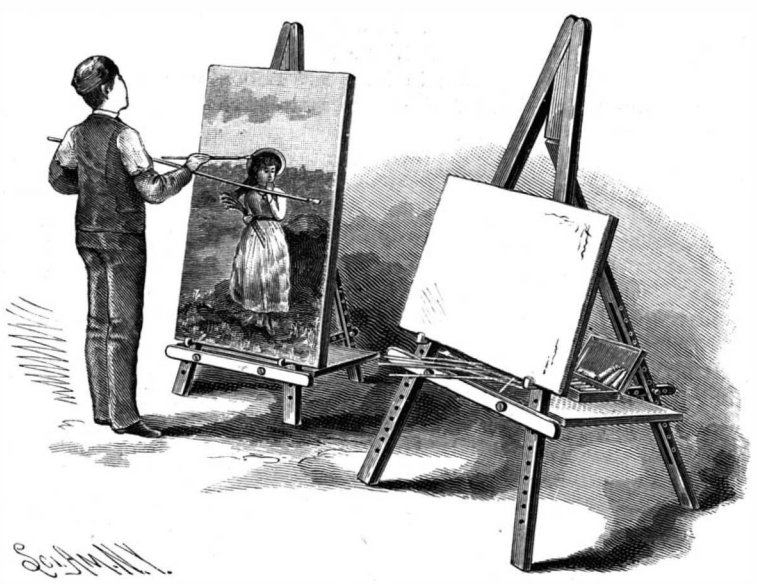


MULHOLLAN'S HARMONICA HOLDER.

illustrated herewith, and has been patented by Mr. William E. Mulhollan, of Portland, Oregon. The body of the holder consists of a nearly flat plate, adapted to rest against the person, with a bottom cross strip to which is attached a strap or retaining band for holding the plate against the body. An attached pear-shaped loop, as more fully shown in Fig. 2, is also adapted to be placed around the neck to sustain the plate, which has a projecting socket in front for the reception of a detachable bent shank, carrying on its outer end a catch or clamp for removably holding a harmonica or other mouth instrument, which is thus supported in convenient position for playing, leaving the hands free for another instrument. In Fig. 3 is shown another form of bent shank adapted to be placed in the socket for holding music in convenient position for reading when performing on a flute or similar instrument.

AN EASEL WITH ADJUSTABLE SHELF.

An easel having a detachable and adjustable shelf, adapted to receive colors, pallette, etc., or articles of bric-a-brac or other ornaments when the easel is employed to display a picture, is illustrated herewith, and has been patented by Mr. William H. Van Wart, of Stonington, Conn. The front legs of the easel are provided



VAN WART'S EASEL.

with a series of apertures, in which are entered suitable pins for the support of a canvas or picture to be exhibited, or these pins may hold a suitable narrow table for such purpose. A shelf which is more or less rectangular, and of a size adapted to that of the easel near its base, is supported in front by a clamp-like cross-piece, attached to the shelf by screws or thumbscrews, the rear leg of the easel supporting the shelf at the other side by means of a bar attached to the under side of the shelf, passing through a slot in the rear leg of the easel, the shelf being held at any desired height by a pin passed through one of a series of apertures. Such a shelf, while useful for holding artists' materials or articles for display, acts also as a brace, imparting both strength and steadiness to the easel. The shelf may be made in sections hinged together to be folded, for convenience in transportation or out-of-door work, with a stud to engage an aperture in the rear leg of the easel, and the forward corners of the shelf recessed where they engage and are supported in position upon the forward legs, by pins placed in apertures provided therefor.

Sugar Machinery.

The British Vice-Consul at St. Iago de Cuba, in a Foreign Office report, states that the sugar estate machinery in use in Cuba is obtained from England, the United States, and France. He says the English sugar mills are found to be the strongest and best, but the French evaporating apparatus is preferred to and found to work better than the English. The general class of machinery made in the United States for export is, in his opinion, unreliable, being simply made to sell, though that used in the American refineries is unrivaled. Small machinery is often ordered from the United States instead of from Europe, on account of the greater promptness with which delivery can be obtained. At present there are two appliances for use on sugar estates for which there should be a good future, viz., cane shredders and furnaces for burning green bagasse. Though there are several in the market, none has so far given universal satisfaction, and the report states that there is a field for really good articles of this kind.

A Great Globe.

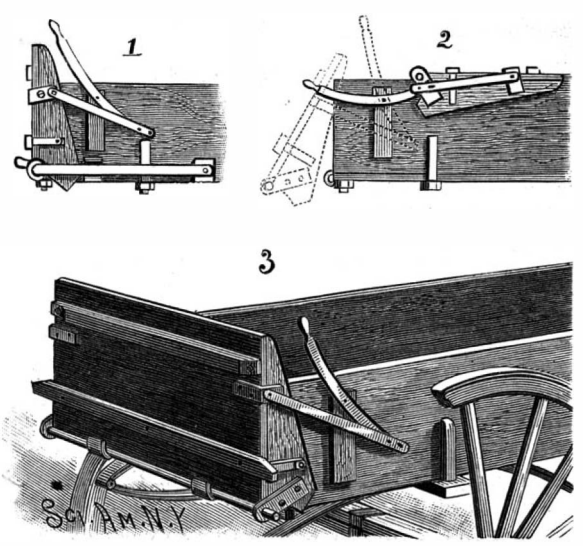
According to *La Nature*, an immense terrestrial globe, constructed on the scale of one millionth, will be shown at the Paris exhibition of 1889. A place will be set apart for it at the center of the Champ de Mars. The globe will measure nearly 13 meters in diameter, and will give some idea of real dimensions, since the conception of the meaning of a million is not beyond the powers of the human mind. Visitors to the exhibition will see for the first time on this globe the place really occupied by certain known spaces, such as those of great towns. Paris, for instance, will barely cover a square centimeter. The globe will turn on its axis, and thus represent the movement of rotation of the earth. The scheme was originated by MM. T. Villard and C. Cotard, and *La Nature* says that it has been placed under the patronage of several eminent French men of science.

Buckthorn in Toothache.

Dr. Gretchinsky has called attention to a practice which obtains among the peasantry in some parts of Southern Russia of treating toothache with a gargle of decoction of buckthorn—*Rhamnus catharticus* (*Lond. Medical Recorder*, June 20, p. 241). He states that, in order to test the ground of this practice, he made a series of control experiments upon a number of inmates of the local prison who were suffering from toothache. The patients were ordered to gargle their mouths with the cooled decoction every three or five minutes until the pain disappeared, and in every case the suffering ceased in about half an hour, though there still remained a vague aching or kind of itching about the teeth. A prolonged anodyne effect was produced by inserting a cotton wool plug steeped in the decoction in the cavity of a hollow tooth. Dr. Gretchinsky considers his experiments proved decoction of buckthorn to be a reliable means for mitigating such dental pain as depends upon inflammation of the pulp. He recommends the decoction to be made by boiling 100 parts of the bark in water sufficient to yield 200 parts of the strained liquid and adding 10 parts of brandy. Another writer attributes the anodyne action to the powerfully astringent properties of the decoction.

AN IMPROVED END GATE FOR WAGONS.

An end gate removably pivoted at its lower edge to a wagon body, and provided with levers, whereby it is moved in and out of position by a person in the wagon, has been patented by Mr. Emil L. Burklund, of Wahoo, Neb., and is illustrated herewith. It is formed with side parts braced by metallic strips, and overlapping the body, and is pivoted at the bottom by means of a rod passing through sleeves or loops on the wagon body, the lower ends of the side parts being curved, and resting upon strips secured to the rear edge of the body, whereby the gate may rock on its lower edge independent of the pivotal connection. The gate is operated and held in closed position by means of handled levers, each pivoted to a strip secured on the wagon body, the outer ends of these levers being each pivoted to one end of a bar, which at its other end is pivoted to a bracket projecting from the side edges of the end gate. The joint between the outer end of the handled lever and the bar is made adjustable, there being different holes in which the pivot pin may be placed, to secure greater range of movement of the end gate. When it is desired to use the end gate for dumping or unloading, the pivotal rod at the bottom is slipped out of the sleeves, when the gate may be thrown out at its lower end, as shown in dotted lines in Fig. 2, or it may be moved entirely out of the way, by means of the levers, and brought down upon the top of the wagon body, in position to serve as a seat, as also shown in the same figure. In Fig. 1 is shown another form of pivotal connection at the bottom of the end gate, for use where the location of the wheels would interfere with the ready removal of the pivotal rod. In the latter case, the end gate has a tubular rod secured by metallic eyes or bent strips to its lower edge, the ends of this rod being held by a catch block on the end of a metallic strip, secured along the



BURKLUND'S WAGON END GATE.

lower edge of the wagon body, there being a handle whereby, with this hinge connection, the lower edge of the end gate may be easily detached or engaged in hinged position.

A MAN who has tried it says that wooden posts treated as follows, at a cost of two cents apiece, will last so long that the party adopting it will not live to see his posts decay. Take boiled linseed oil, and stir in pulverized charcoal to the consistency of paint, and put a coat over the timber.

© 1888 SCIENTIFIC AMERICAN, INC.

Development of Public Lighting in France.

At the recent annual congress of the Society Technique du Gaz, at Boulogne, M. Ellissen delivered an interesting address, from which we take the following, as given in the *Journal of Gas Lighting:*

Referring to the growing demand for increased illumination, which is a characteristic of the social life of the present day, M. Ellissen quoted some figures recently laid before the Physical Society by M. Mascart. About a century ago, a grand *fete* was given in the Salle des Glaces, in the Palace of Versailles—one of the finest rooms in the world—and about 1,800 wax candles were employed in the lighting. In 1873, on the occasion of another *fete* in the same place, 4,000 wax candles were used, while three years later, 8,000 candles were necessary. So that in 1878 just twice the amount of illumination, for the same superficial area, was required, in comparison with what was regarded as sufficient five years previously, and more than quadruple that employed a century ago.

Turning to public lighting, the president remarked that the setting up of a few electric arc lamps called the attention of municipalities to the necessity for increasing the lighting of the public thoroughfares, and the result has been the employment of high power gas burners.

M. Ellissen thinks we may hope to see in the future the streets and open spaces lighted in such a manner that drivers of vehicles will be able to dispense with lamps for finding their way and avoiding collision, the existing necessity for these lights causing, he considers, the mind to revert to the time when pedestrians carried lanterns with them as they traversed the streets at night.

On this subject he quoted the following interesting particulars as to the origin and development of public lighting in France, as contained in the work of M. Edmond Thery: We have to go back to the year 1558 before the first traces of public lighting in Paris are met with. By a decree of Parliament, made in the month of November in that year, it was ordered that a lighted lantern (*une lanterne ardente et allumante*) should be placed at the corner of each street from ten o'clock at night till four o'clock in the morning, and where the streets were so long that the lantern was unequal to lighting them from end to end, other lamps were to be placed at suitable intervals. This first attempt at public lighting was attended with but small success, and during the troubles of the League, the decree was disregarded. In 1662—that is, more than a century later—a fresh attempt at lighting the streets was made. By letters patent granted by Louis XIV., and registered by Parliament on August 26, 1662, the privilege of public lighting was accorded to one Laudati Caraffe, who, however, was to enjoy it for a period of five years only. The system proposed by Caraffe was the establishment of stations where the services of lantern and torch bearers could be secured for a few sous, to conduct pedestrians to their destinations. The lantern bearers made use of yellow wax tapers, about 1½ pounds in weight, marked with the arms of the city, and divided into ten equal parts. Pedestrians who desired to be conducted and lighted paid 5 sous for each part. The lantern men also lighted carriages and sedan chairs at a charge of 5 sous for every quarter of an hour they were engaged. In order to check the time, each man had suspended from his belt a sand glass (also marked with the city arms), arranged to run 15 minutes, and this he reversed when starting on his journey. The lantern bearers were posted at distances of 800 paces one from another. The central bureau, situated in the Rue St. Honore, was opened to the public on October 14, 1662, but, notwithstanding the originality of the system, the hopes of the inventor for its success were far from being realized, and he ruined himself in the undertaking.

The real originator of the public lighting of Paris was the Lieutenant-General of Police, La Reynie. At his suggestion, a royal edict was issued in 1667, prescribing the establishment of lanterns, containing lighted candles, suspended from ropes at the height of the first floors of the houses. This experiment was thoroughly successful, and at the end of the seventeenth century, Paris had 6,500 public lanterns, in which were consumed nightly about 1,625 pounds of candles. The Parisians, as well as the foreigners resident in the city, were enraptured with this method of lighting, which they regarded as a *chef d'œuvre*. One of the latter, writing on the subject at the time, went so far as to say that the spectacle of the illumination of Paris at night by means of an infinite number of lamps was so beautiful and so complete that "Archimedes himself, had he been living, would have been incapable of adding anything more useful and agreeable." The street lamps in which oil was consumed, and which were furnished with reflectors, did not make their appearance until a century later. They were the invention of Bourgeois de Chateaublanc, who was intrusted for a period of twenty years with the lighting of Paris. This was assuredly great progress, and the song writers of the day did not fail to direct their good humored railleries against the poor old candle lanterns. It was quite seriously believed that the perfection of public lighting had been attained, and M. De Sartines, in the course of a memorial addressed to the King in 1770 on the subject of the police administration in France, said, in reference to the new street lamps, that the large amount of light afforded by them justified the belief that it would never be possible to find anything better. "It is probable," remarked M. Ellissen, alluding to the ridicule cast upon the old candle lamps, "that our children also will laugh at the methods of lighting by gas, and even by electricity, such as we know them to-day."

In 1787, Aime Argand, a Genevese, invented a lamp with a glass chimney, which was unjustly called Quinquet, after a great lamp seller of the period. This lamp was improved upon by a tinsmith and lamp maker of the name of Vivien. It was this lamp that the marvelous invention of Philippe Lebon had so much difficulty in dethroning in France. Lebon was born in Champagne in 1767, the year of the invention of street lamps, and was discharging his duties as professor of mechanics at the Ecole des Ponts et Chaussees in Paris when he conceived the idea of employing combustible gas, obtained by the distillation of wood, for the lighting of houses and the public thoroughfares. He took out his first patent on September 28, 1799. Since that time, what progress has been made by the invention of Philippe Lebon! It was not, however, until 1820 that the first gas company was constituted in Paris. During the ten years from 1844 to 1853, the six gas companies then existing distributed 246 million cubic meters, being, on an average, 24 million cubic meters per annum. But it is chiefly from the formation of the Paris Gas Company by MM. Emile and Isaac Pereire that dates the real development of gas consumption in Paris. The volume of gas sent out from this company's works in 1856 was about 10 million cubic meters, whereas in 1866 it had reached 122 millions, in 1876 had further advanced to 189 millions, and in 1887 was 291 millions.

The Commercial Aspect of Electric Lighting.

The record of litigation in connection with important patents relating to electric lighting has been, so far as this country is concerned, a singularly disastrous one for their owners. The attempt of Siemens to obtain a patent, which, if successful, would virtually have controlled the manufacture of the modern type of dynamo machines, was frustrated by his delay in making application until one of the machines had been two years in use in the United States. The Gramme syndicate were defeated in their efforts to place themselves in a similar position, by reason of the expiration of a prior foreign patent for the invention. The Brush company brought a suit to enforce its patent on the arc lamp, and after a protracted and expensive legal contest, was defeated by the production of evidence of an actual, though limited, prior public use. And now the Edison incandescent lamp patents appear to be doomed to share the fate of their unfortunate predecessors.

As a result of this state of affairs, the public has enjoyed what has been practically an era of unrestricted competition in both arc and incandescent lighting, for some ten years. But contrary to the general opinion, indications are by no means wanting that the present condition of things is likely to undergo a material change at no distant day. A combination or consolidation of electric lighting interests has often been discussed, and sundry attempts have been made in the past to realize it. But the combined resistance of the innumerable personal interests which would be affected by such a move has been far too great to permit much real progress in the desired direction to be made. Meantime the stockholders of the electric light companies, as well as the public, have gradually become more and more disgusted with the present outlook. Only a very small proportion of the vast sums of money embarked in electric lighting enterprises has yielded any return whatever, and it is becoming painfully evident that the bulk of the investment must sooner or later be charged to the account of "profit and loss." On the other hand, the public is badly served; many plants are becoming dilapidated, and the catalogue of disasters to life and property is lengthening with ominous rapidity. There exists, in fact, an exact reproduction of the state of affairs which existed in the telegraphic service thirty years ago, and as surely as history repeats itself, so surely the same remedy will be applied—consolidation or union of interests. Such a consolidation will not come voluntarily. It can only be brought about, like the welding of metal, by the combined effects of internal heat and external pressure. Many considerations, some of which are of a commercial and others of a legal nature, indicate that the beginning of the end is not far distant. However well founded the public antipathy to monopolies may be, it must at least be affirmed of an electric light monopoly that it is so closely hemmed in by its great rival, gas, that no fear of extortionate charges need agitate the mind of the prospective consumer. But the history of the consolidation of the telegraph interests clearly shows that the real source of future profit lies in the reduction of expenditure and in the increase of the business. Every one knows that the money received in the electric lighting business to-day would yield a very large profit, if all unnecessary expenses were abolished. That the force of circumstances must ultimately bring about the result we have pointed out, in spite of all opposition on the part of persons interested in preventing it, seems to us as certain as any future event can be.—*Electrical Engineer.*

Fire Discipline with the Magazine Rifle.

At the Royal United Service Institution, recently, Major-General E. H. Clive, Commandant of Sandhurst Staff College, presiding, Captain Walter H. James, late Royal Engineers, gave a lecture on "Fire Discipline and the Supply of Ammunition in the Field as Provided for by Foreign Powers." The lecture was regarded as supplementary to one by Captain James two years ago on magazine rifles. The lecturer commenced by quoting the oft-repeated remark that modern war was less deadly than ancient—that the loss of life which a nation suffered in the fighting of to-day was more moderate than that which occurred in olden times. This might be true, he said, as regarded the general result; but certainly the improvements in modern arms had rendered the losses at the points where collision actually took place far more deadly than they were with the old weapons.

He proceeded to describe the Prussian, French, and Austrian regulations in regard to fire discipline, and showed, in regard to the Prussian, that the magazine fire, as a rule, was only used at close ranges; but that a rapid fire was employed at artillery at over 900 yards, three fires being recognized, "volley," "independent," and "magazine," and the signaling of orders was by whistle. The firing in the French and Austrian services was much the same. The Prussian and Austrian soldiers carried each 100 rounds, and provision was made to add 98 by wagon to each Prussian soldier's supply, and 83 to the Austrian, while the French soldiers carried 78, and his supply by wagon was made up to 177. The lecturer gave other details of regulations in these armies, and pointed out the stress which was laid by these nations on the preparation of the men for the difficult *role* of modern fighting. Italy and Belgium both had systems directed to the same end—the control over the fighting line by its division into units capable of being influenced by one man. All the work meant careful training, and, in conclusion, he drew attention to the increased ammunition supply which both Prussia and Austria had already given to their men. These supplies would be considerably augmented when the new small-bore rifles were introduced. But the new departure should present nothing difficult to the British army if it would but remain true to the old guiding lines. It was superiority of fire which gained the reputation of English bowmen, it was superiority of fire by which Wellington beat the French at the beginning of this century.

If the natural aptitude for shooting was carefully trained, we could hold our own under any conditions. But it must be trained, and training was not to be got on the barrack square, but by careful practicing in peace the tasks that fell to the soldier in war, under conditions which represented in everything but loss of life the actual realities of modern fighting.

Narrow Escape of a Physician from Poisoning by a Cobra.

Dr. Vincent Richards, of Calcutta, an enthusiastic investigator in many different lines of medical research, had a narrow escape recently from poisoning by a cobra bite. He was holding a vigorous cobra in his right hand for the purpose of obtaining its venom. In pointing with his left forefinger to where some watch glasses lay, he brought the part close to the animal's head. The snake made a sudden dart, and fastened its fangs just below the second joint. Retaining his presence of mind, Dr. Richards tore the reptile away and killed it. A tight ligature was at once placed on the proximal aspect of the wounds, which were sucked, enlarged by knife, allowed to bleed freely, and thoroughly mopped with a five per cent solution of permanganate of potash; an India rubber cord was bound around the wrist. A medical friend subsequently further enlarged the wounds, and applied strong nitric acid to them. The ligatures were cautiously removed after a time. No symptom of poisoning resulted except a slight tightness of breathing.

Absinthe.

It appears from recent researches made by Mr. G. Varenne that absinthe is of itself not by any means so poisonous as it is usually supposed to be. This investigator finds that its toxicity is due to the use in its manufacture of the tailing of the spirit stills, *i. e.*, the residua which contain all the impurities of the alcohol. It is said that absinthe made with pure rectified spirit produces none of the effects ordinarily known as absinthism. The amount of oil of absinthe used in making the drink is very small, and the temptation to use the worst kinds of alcohol in its manufacture is of course large, because the bad flavors are easily disguised in so aromatic a drink.—*Dr. Bulletin.*

© 1888 SCIENTIFIC AMERICAN, INC.

A MARINE TOBOGGAN SLIDE.

BY H. C. HOVEY.

Tobogganing has become such a favorite winter pastime that the idea occurred, some time ago, to Mr. C. J. Belknap, of Bridgeport, Conn., that it might be adapted to the summer months also. He drew his plans in 1885, but did not carry them into execution till 1887, when he built the marine toboggan slide now described. It is an adjunct of the large bathing establishment at Seaside Park. The artificial slope rises from high water mark to the height of thirty-two feet above it, where there is a suitable platform that is reached by a flight of steps. The chute itself is but twenty inches wide, and contains 725 wheels for the sleds to run on. It is the inventor's intention this season to replace these wheels by a series of brass rollers each sixteen inches long. Almost any common toboggan will answer the purpose; but the patented "star oval board" will encounter less friction than a flat surface, and will meet with less resistance on striking the water. The slide is open to all at certain stages of the tide; but at high water none are admitted but good swimmers. The chute is 178 feet long. The toboggans start at the signal given by a bell, only one being allowed to go at a time; and on being projected from the lower end, they ricochet across the waters of the Sound for a distance varying from 75 to 175 feet, skipping along like a flat pebble, till the force acquired in the descent is lost, after which the bather swims ashore, pulling his sled after him. The facial expression of novices taking their first adventurous slide is quite remarkable, and the sensations felt are correspondingly novel and peculiar. The popularity of this new form of summer sport is proved by the fact that, during the month of August last, 11,000 slides were paid for at two cents a slide. Crowds of spectators were daily assembled to witness the exciting scene. The illustrations accompanying this account are from instantaneous photographs.

Improving Country Roads.

A writer in the *Wagon Maker*, on the above subject, concludes that it is a work too little thought of, too negligently done, and often so misapplied as to make roads worse rather than better. To see the black, mucky soil on the sides of roadways plowed up and scraped into the center, there to remain an impassable ridge during the summer, finally degenerating into an unfathomable slough of mud the next winter or spring, is enough to discourage the man who knows how roads should be made, and even force him to regard laziness in working out the road tax one of the excusable sins, if not actually a positive virtue.

In our climate, deep freezing combined with too much water is the bane of roadways. We cannot altogether prevent deep freezing, but if there be ample underground drainage, it will not effect great damage. The first object, then, of the road maker should be to secure good drainage. Without this, ridging the road only makes the mud deeper, and even stone or gravel do little good. It is often forgotten that the chief advantage from using an abundance of stone and gravel in road making is the incidental drainage which these afford, even when piled in the roads with no idea of this use. If the center of the road is underlaid with stone, and then ridged up with earth or gravel, it does for years form a good drain to keep the roadbed dry. But sooner or later frost will penetrate to these stones and upheave them. Then the last condition of the improved roadway will be worse than the first.

The fact is often forgotten that in a dry, compacted road, well ridged up, the soil freezes deeper than it does in the fields. This is especially so where the road is exposed to winds and swept bare of snow. The drain under the roadbed should be not less than three feet deep, and, if possible, four feet would be still better. Whether made with tile or stone, it should be laid as carefully and the joints covered as closely as if it were laid in the fields. Then, with good outlets and side drains to conduct the water from the center in all the low places, and with comparatively little ridging up with stone or gravel, the roadbed will be kept in good condition for years.

It is not the amount or sharpness of the ridge in the center that makes a roadway good, but the character of the surface and its uniform slope to either side. Ruts spoil roads quicker than anything else. They are the reservoirs for water, which, mixed by heavily loaded wheels, grinding it into the soil and making mud, renders it impossible for water to break its way through. Over the drain should be a foot or more of subsoil to keep the frost out, then followed by stone to a depth of six or eight inches, pounded fine on top and covered with gravel. There will always be an outlet under the stone to the drain below, and if its outlet is kept open in low places, the surface of the roadbed will always be dry. Such a road cannot become muddy except for an inch or so on the surface.

It costs something to thoroughly underdrain a roadway and improve it after this manner, but, once done, it will last practically forever if the drain outlets are kept open. Doing a little piece each year, the people in any road district may in time have good roads, that will need only trifling attention to keep in repairs. It is far better than the wasteful way of trying to improve long sections of roadway every year, and doing generally quite as much harm as good. The difference between having good and bad roads to market does practically affect the valve of their land more than most farmers think. If they appreciated this as they should, thousands of them would take a greater interest in the way their road tax is worked out than they have ever done before.

The Metric System.

Ten mills make one cent, ten cents make one dime, ten dimes make one dollar, ten dollars make one eagle. This is the metric or decimal system. It is easily understood by everybody, has been in use, in respect to our coinage, ever since the foundation of the government. How desirable it is that it should be substituted for the old system in all our expressions of weights and measures.

An estimate, worthy of confidence, of the saving in the teaching of arithmetic in schools was published in the "Proceedings of the American Metrological Society," vol. ii., p. 193, in these words:

"A schoolmaster who has had experience both in New England and in the West, and has taught the metric system, has made a careful detailed estimate. He puts the length of the arithmetical course at 162 weeks, and thinks it could be reduced to 88 weeks by substituting the metric system for our old weights and measures. The saving of 74 weeks, or 46 per cent of the course of study in arithmetic, pursued simultaneously with other branches, would probably amount to nearly a half year solid of school life."

Assuming the whole length of school life even at so extravagant a figure as ten years, the saving for more useful purposes would thus be five per cent of the child's education, which is an important item. According to the report of the United States Commissioner of Education for 1884–5, the expenditures for public schools in all the States and Territories of the Union in that year amounted to upward of $110,000,000, of which nearly $66,000,000 was paid for the salaries of teachers. A saving of 5 per cent per annum on $110,000,000 is $5,500,000. Capitalized even at the excessive rate of 10 per cent, this gives $55,000,000 as the amount which it would on this basis appear that the United States could afford to pay out now, if it could by so doing get rid immediately of the perpetual annual expense hereafter of teaching ancient weights and measures in public schools. Private schools would have to be added to this to get a complete estimate even of school instruction. The number of children enrolled in the public schools was upward of 11,000,000. Hence $5 for each child is the rate of the above $55,000,000 estimate; the number of "teachers and scientific persons" in the United States, according to the census of 1880, was nearly 228,000, while upward of 17,000,000 of other persons were classed as having occupations. How much would the introduction of the metric system save these other 17,000,000 citizens? Evidently the waste of effort by the use of bad weights and measures after they were once familiar would be a less proportion than the waste of effort to learn them at first; but if, instead of 5 per cent, it were 1 per cent, or 1-10 of 1 per cent, on the industry of the 17,000,000 persons having occupations in the United States, and 1 per cent, or 1-10 of 1 per cent, on every citizen's income, it is a matter that we cannot afford to ignore.

That a valuable proportion of the labor that is expended upon business calculations could be saved by the substitution of the metric for the old weights and measures, cannot be doubted by any one who compares a few tables, such as have been in use for reference, with the corresponding ones appropriate to the metric system; although the contrast of calculations, if the tables were once made, and were known to be correct, and were always at hand when wanted, would obviously be less than that of the tables themselves.

To Avoid Noxious Gases in Houses.

The best way of securing the house against danger from its pipes during times when it is not occupied is a matter upon which plumbers are by no means agreed. The danger to be guarded against when the house is shut up and the people are gone away on vacation is the emptying of traps by evaporation or siphonage. Some plumbers go so far as to say there is no safety short of disconnecting the fixtures and securely closing the ends of the pipes. Others recommend shutting the water off and filling the closet with oil. Some suggest simply shutting the water off, while others would do this and also ventilate the closet. Filling the closets and traps with raw oil or glycerine after shutting off the water is a favorite recommendation. Some plumbers favor an adjustment of the valves so there will be a continual dripping of water. The *American Artisan* wisely suggests that, where a house is to remain closed for some time, the best plan is to arrange with some person to go into the house once a week or so, let the water circulate throughout the house, and take a look around to see that all is right.

Central Park Trees.

The trees in the Central Park, in this city, have not looked as well as they do just now for a number of years. The cool, late spring, the abundant rains of May, and the heat of the early summer have all been favorable to a vigorous and healthy tree growth. Most of the trees, with the exception of the half dead Norway spruces, which are covered with red spiders, are unusually free of insect pests. The American elms have made a remarkable growth, and when planted under favorable conditions, are now objects of great beauty. The American and European lindens are very fine, too, and several species are now covered with their fragrant flowers. The two silver lindens (*Tilia argentea* and *T. petiolaris*) are striking and attractive in habit and in the pleasing color of their foliage. No foreign trees are better entitled to a place in our plantations than these two European lindens, of which many fine specimens exist in the park. The six thousand trees which have been removed from the park during the past year are not missed. The work, as far as it goes, seems to have been judiciously planned and executed. No one would now suspect that a single tree had been cut; and the park plantations and the general appearance of the park would be immensely improved if thirty or forty thousand trees were removed during the present year. They would no more be missed than those already cut are missed. Dying conifers still disfigure the park in all directions; everywhere fine trees are in danger of being ruined from overcrowding, while the removal here and there from the plantations of inharmonious elements, as where, for example, trees with light and feathery habit are too closely associated with round-headed, compact trees, would add immensely to their natural and harmonious appearance. There are cases, too, where trees of peculiar rarity or interest should be freed from encroaching neighbors, that their full development and long life may be insured. This is the case with the Asiatic elm (*Ulmus parviflora*) which stands near the Seventy-second Street entrance from Fifth Avenue. This is without doubt the largest and finest specimen of this rare tree in the United States. It is a specimen not only of extraordinary interest, but of great and peculiar beauty. It now forms one of an inharmonious group of three trees. On one side it is being pushed out of shape by a common tupelo or sour gum tree, while its branches on the other side are stunted by a common European maple. It is hard to imagine a more incongruous or less pleasing combination of trees; and it is clearly for the interest of the park and of the public that the maple and the tupelo should be cut away and that every opportunity should be given to the elm to spread its branches out freely in all directions. There are hundreds of just such cases all over the park where interesting and valuable trees are being ruined in this way; but in the particular case to which we venture to call the attention of the park authorities, the prominent position of this beautiful tree and the great interest which it excites among all persons who know it, seem to warrant us in urging prompt action to insure it from further disfigurement.—*Garden and Forest.*

Slipping.

The statement that engines slip continually while running at full speed is often made, but almost invariably by persons of no practical experience, who appear to be unaware that any slip of the drivers can be instantly detected by an engine runner. Any one who has run a fast train knows that on entering a damp tunnel slipping occasionally occurs, but the vibration imparted to the engine is so peculiar that no one who has once felt it is likely to fail to recognize it again. Messrs. Abbey and Baldwin, when making some observations on the running of a Jersey Central express passenger engine on the Bound Brook route,* found that the slip at high speed was practically *nil*. The wheels, as calculated from their diameter, should give 298·98 revolutions per mile. A counter showed that 298·62 revolutions per mile had been actually made, the difference being negative and only ⅓ of a revolution per mile, or within the limits of errors of observation. As these engines are run very hard and made to do their utmost, it might reasonably be expected that they would show slip, if any existed at high speed. It is therefore reasonable to suppose that any continuous slipping at high speed is non-existent. The continuous slipping theory is supported by so very little evidence, either practical or theoretical, that it must take its place among the numerous other pseudo-scientific delusions.—*Railroad Gazette.*

A Remarkable Meteor.

A dispatch from Appleton, Wis., says: "At 2:30 in the afternoon of July 2 a tremendous meteor was observed to pass across the southern sky from east to west. It rivaled the sun in brightness and left a long train of sparks in its wake. The meteor moved slowly and was evidently at a very great height. It was visible for half a minute, and finally faded away without noise."

*See *Recent Locomotives* (enlarged edition), p. 79.

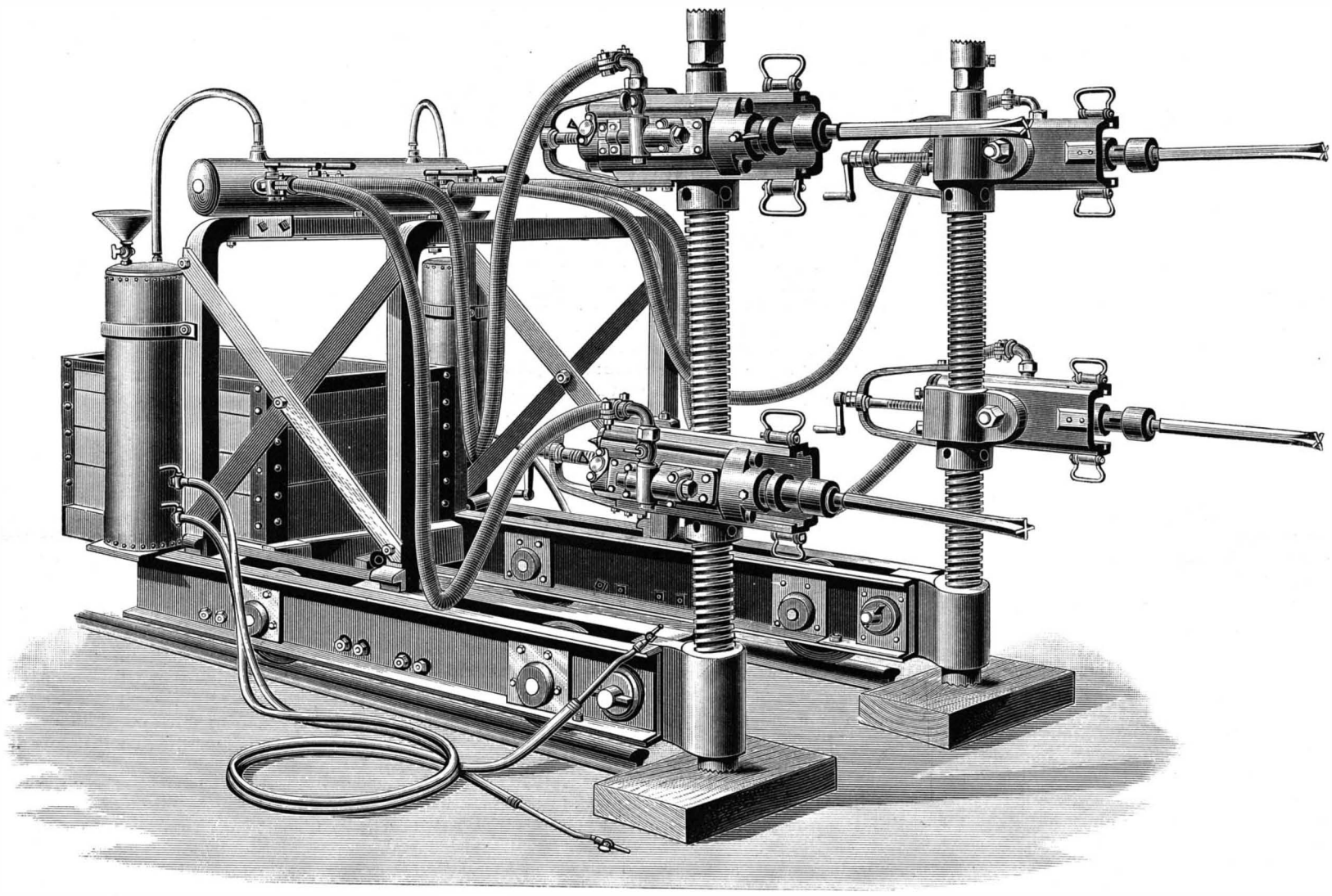
© 1888 SCIENTIFIC AMERICAN, INC.

IMPROVED ROCK DRILLING MACHINE.

We illustrate below a carriage designed by Mr. Richard Schram, London, to carry four of his drilling machines, and which is intended for use in driving a tunnel 2½ miles long on the Khivaja-Amran branch of the Quetta Railway. The carriage carries two stretcher bars, each of which supports two drilling machines, the arrangement of the carriage and bars being such that trucks for the removal of debris, etc., can be run right through it, so that it is unnecessary to provide any sidings in which to run the carriage when the removal of spoil becomes necessary. This arrangement has the further advantage that the drilling machinery can be brought up to the working face before all the debris has been removed, thereby economizing time. In cases where timbering is necessary, and the stretcher bars have to be lowered to clean up, arrangement is made whereby these, with their machines, can be turned back down on to the carriage.

The small receiver shown on top of the carriage is for the distribution of air, and it has two inlets and four outlets, corresponding to the number of drills. The tanks shown on each side are the water injectors, the injection being effected by admitting air under pressure above the surface of the water. The tunnel for which the machines are designed will be driven not only from each end, but by sinking a shaft midway two additional working faces will be provided, making a total of four points of attack. The four sets of tunneling plant required have all been supplied by Messrs. Schram, and amount *in toto* to eight locomotive type boilers, four air compressors, with their receivers, four carriages of the type just described, and thirty-two rock boring machines, with all the accessories necessary for opening out the tunnel, the whole of the machinery being carried out under the inspection of Sir Alexander M. Rendel.

We understand that Messrs. Schram are also supplying a complete installation for the driving of a tunnel one mile long in connection with the Perigar project for the Madras public works. In this, however, a turbine will be used in supplying the power to the compressors.—*Engineering.*



IMPROVED ROCK DRILLING MACHINERY.

A Small City on a Block.

Work has been commenced on what may very well be called a small city, to be built on the block bounded by 10th and 11th Avenues and 66th and 67th Streets, New York. John Ruck intends erecting there 64 tenements, 48 being without and 16 with stores. The former will accommodate 10 families in each building, and counting 6 persons to the family, the total would be 2,890. The latter will accommodate 8 families in each building, or a total of 768, making a grand total for the block of 3,648; or putting the matter in another way, the density of population at that spot of the city will be 912 to the acre. The *Real Estate Record* thinks it is possible that these figures may be increased by building four of the houses on the streets extra deep, so as to accommodate 144 additional persons. For the sake of obtaining light and plenty of fresh air, an unusual arrangement of the buildings has been decided upon. Those on the avenues will be 25 × 65, with the exception of the corner ones, which are 71 feet deep. Between these houses and the side walls of the buildings on the streets an open space 29 feet at the narrowest part and 35 feet at the broadest will be left, so that a passer-by turning off from either of the avenues on to the streets would find, where the corner building terminates, an open space (usually occupied by a structure) between it and the first of the houses on the street. The capital necessary for the undertaking will be furnished by the Equitable Life Assurance Company, and we hope to be able to present illustrations and further description of this gigantic building enterprise in a future issue of the ARCHITECTS AND BUILDERS EDITION of the SCIENTIFIC AMERICAN.

Reclaiming an Arid Region.

Late in March an act of Congress was signed by the President requiring the Geological Survey to study the practicability of building storage reservoirs for water in the arid portion of the country for the purpose of reclaiming an immense area of waste lands by irrigation. This question has already received much attention from the director of Survey and from other competent authorities, and no further inquiry is needed to convince Dr. Powell of the feasibility of using the waters of the upper Missouri and of its tributaries to impart fertility to an enormous region. The work now before the Survey is to locate and explore the various drainage areas and to reach an approximate idea of the cost of the proposed irrigation works, obtaining exact information with regard to facts already known in a general way.

When Dr. Powell gave his testimony before the joint commission of the Senate and House in 1886, he asserted that the greatest engineering problems in America are the protection of the flood plain of the lower Mississippi from overflow and the reclamation of the great Western plains from their desert condition. These problems, he believed, were practically one, for the engineering process which should spread the surplus waters of the rivers over the arid area would relieve the burdens of the lower Mississippi. He was also of the opinion that for every acre redeemed from overflow in the South two or more acres could be restored to fertility on the great plains.

The problem, then, is to retain in the regions where they originate the great floods of the upper Missouri that now pass uselessly into the Gulf of Mexico, inflicting great damage on their way upon the fertile lands of the lower valley. It is Dr. Powell's opinion that the cost of utilizing all this surplus water for irrigation will be greatly reduced by diverting each of the little streams that contribute to the upper Missouri. To divert the water from the Missouri itself would imply great hydraulic works—an expense that would be considerably lessened by gathering the waters at their sources.

The scheme appears to include the idea of building great dams across the canons through which pour the melted snows and heavy rains from the mountains. These dams are to be large and strong enough to hold back the waters, which may then be let down as they are needed for the benefit of the reclaimed lands. The cost of these irrigation works will be very great, but it will be only a small fraction of the value of the land reclaimed. It is believed that by wisely utilizing the surplus waters in the drainage area between the one hundredth meridian and the eastern slopes of the Rocky Mountains, an unproductive region equal to at least four times the area of New York State may be restored to fertility. The decided success of irrigation works in California, Utah, and Colorado indicates the methods by which we are still further to reduce the profitless area which we formerly designated as the Great American Desert; and the entire country cannot fail to feel the benefits of improvements of such magnitude as to add many millions of acres to our area of fertility and free the Mississippi lowlands south of Cairo from the great hinderance in the way of their prosperity.

It is said that two years will be required for the necessary surveys and the preparation of the plans, and it is hoped that funds for the preliminary investigations will be included in this year's appropriation for carrying on the work of the Geological Survey.—*N. Y. Sun.*

Distillation of Mercury at Ordinary Temperatures.

W. Hallock, in a note to *Science,* says: In the physical laboratory of the United States Geological Survey, Washington, a normal barometer hangs in a window jamb about 35 centimeters from the glass of the window. As the window faces east, it has the sun until noon. The barometer tube at and above the upper surface is 25 millimeters in diameter, and extends 6 centimeters above the mean position of that meniscus. It was observed that during the summer small globules of mercury covered the inner wall of the tube above the column, on the side farthest from the window. In the winter they collected upon the side nearest to the window. An inspection showed that the radiation from the tube was greatest toward the cool room in the summer and toward the window and out of doors in the winter, thus keeping the side of greatest radiation slightly cooler than the mass of the reservoir, and condensing upon it some of the vapor of mercury of the Torricelli vacuum. In this way several grammes were condensed and fell back in a single month—a fact which seemed quite interesting when it is remembered that the vapor tension of mercury at even 30° C. (86° F.) is only 0·06 of a millimeter. Of course, by bending the top of the tube over and downward toward the cooler side, the distillate could be collected and measured.

© 1888 SCIENTIFIC AMERICAN, INC.

SIMPLE EXPERIMENTS IN PHYSICS.

BY GEO. M. HOPKINS.

The experiments in the diffusion of gases described in the last article may be tried on a large scale by employing a porous Turkish water cooler instead of the porous cell, and using a larger and longer glass tube. A large bell glass or glass shade may serve as the gas-containing vessel. The action may be made more distinctly visible by coloring the water.

A convenient and inexpensive way of showing the same phenomena on a small scale is illustrated by Fig. 1. An ordinary clay tobacco pipe answers for the porous vessel. A short, centrally apertured cork is fitted to the bowl of the pipe, a glass tube, of about one-eighth inch internal diameter, is fitted to the bore of the cork, and the cork is carefully sealed. By connecting the stem of the pipe with a gas jet or hydrogen generator, by means of a flexible tube, and inserting the glass tube a short distance into water, the gas will bubble up through the water. After shutting off the gas at the burner, or by doubling or pinching the rubber tube, the water will immediately rise in the glass tube—showing that in the exchange of gas and air through the pores of the clay, the outward movement of the gas has been much more rapid than the inward movement of the air, thereby producing a partial vacuum, which causes the water to rise.

By breaking off the stem of the pipe near the bowl, the pipe and glass tube may be plunged in a deep glass jar, when the experiment may be proceeded with as follows: A little water, say one-half inch in depth, is poured into the jar, after which the jar is filled with carbonic acid gas. Illuminating gas, or hydrogen, is allowed to flow through the pipe while it is removed from the jar, so as to drive out all the air and fill the pipe with gas. The gas is now shut off and the pipe is immediately placed in the jar with the glass tube plunged in the water. The effect is the same as in the case of the air and gas, *i. e.*, the carbonic acid gas goes in and the hydrogen gas goes out; and when equilibrium is established, the pipe will contain some carbonic acid. This may be proved by removing the pipe from the jar and plunging the glass tube into some clear lime water, then allowing the gas to flow only long enough to force out the contents of the pipe. The presence of the carbonic acid is indicated by the milky appearance of the lime water, which is due to the formation of carbonate of lime.

There is sufficient carbonic acid in the exhalations of the lungs to show an action which is the reverse of that observed in connection with illuminating gas. When the pipe is blown through, and the end of the stem is quickly and completely stopped, one or two bubbles will escape from the glass tube, showing that the inward movement of the air through the pores of the clay is more energetic than the outward movement of the carbonic acid.

The diffusion of gases may be shown by the well known experiments illustrated by Figs. 2 and 3. A medium sized fish globe, a very small fish globe which will pass into the larger one, and a piece of bladder, are the requisites for this experiment.

The small globe is filled with carbonic acid gas, and the bladder, previously moistened, is placed loosely over the mouth of the jar and tied so as to render the connection between the bladder and the globe airtight.

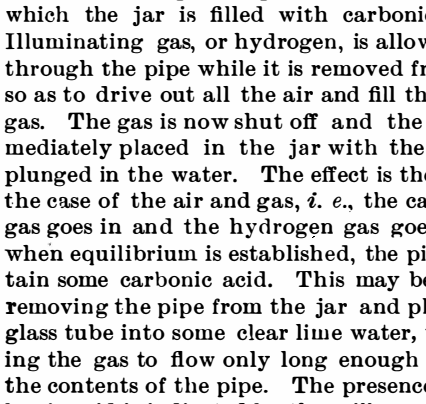
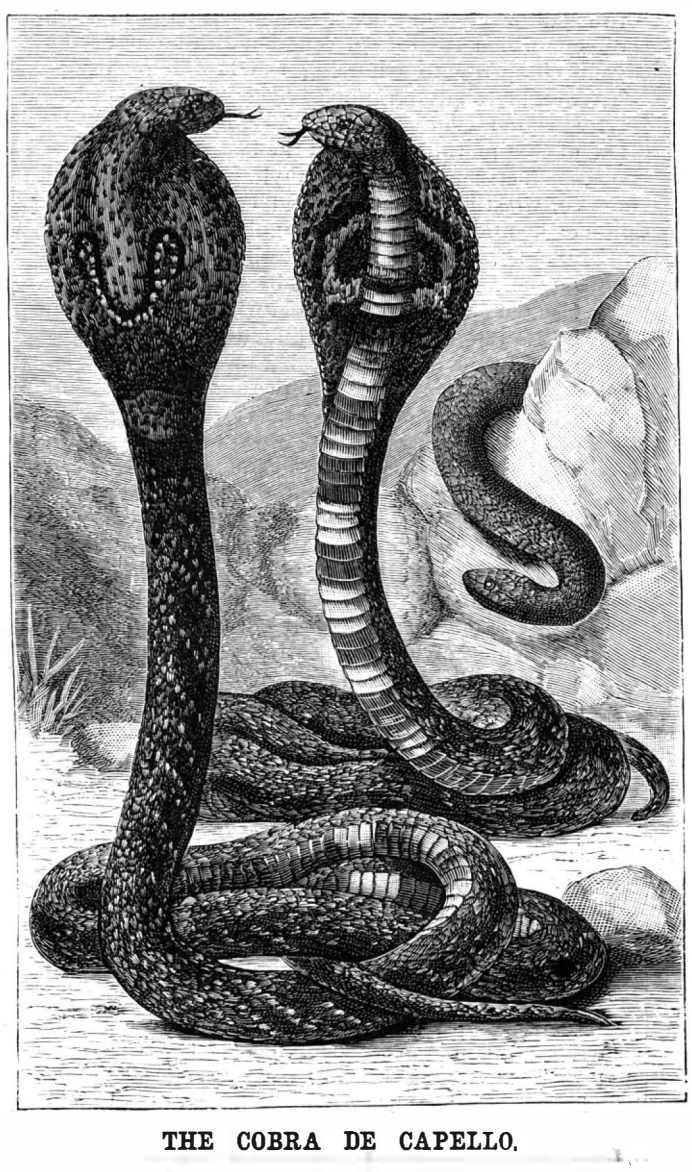


Fig. 1.—SIMPLE WAY OF SHOWING THE DIFFUSION OF GASES.

A good way to insure a tight joint is to stretch a wide rubber band around the neck of the globe before applying the membrane. The large fish globe is filled with hydrogen or illuminating gas, and the small globe is placed under it, as shown in Fig. 2. As the hydrogen passes inward through the membrane more rapidly than the carbonic acid passes outward, the membrane is distended outwardly. It requires a little time to produce a visible effect. When the small globe is filled with hydrogen, and the large one with carbonic acid, the membrane will be distended inward as shown in Fig. 3. In this latter case the experiment may be performed with the least trouble by placing the large globe with its mouth upward, and closing it by means of a plate of glass.



THE COBRA DE CAPELLO.

Endosmose proceeds from the rarer toward the denser gas. The law governing the diffusion of gases, according to Graham, is that *the force of diffusion is inversely as the square roots of the densities of the gases.*

When two miscible liquids are separated by a porous partition, they diffuse one into the other. A simple endosmometer for showing this action is shown in Fig 4. It consists of a small funnel having its mouth closed by a piece of bladder held in place by a wide rubber band stretched around the rim of the funnel. The funnel thus prepared is immersed in water, for example, and is filled to the level of the water with sirup of sugar. The water passes through the bladder into the funnel and the sirup passes out. The rise of the liquid in the funnel indicates that the water enters more rapidly than the sirup escapes. The presence of the sirup in the water may be detected by taste. That the water passes through the membrane into the funnel may be proved by adding to the water a small quantity of sulphate of iron, and after the experiment has proceeded for a time, adding some tannin to the contents of the funnel. If sulphate of iron is present in the funnel, the sirup will turn dark upon the addition of the tannin.

If the neck of the funnel proves to be too short, a glass tube may be connected with it by means of a short piece of rubber tubing.

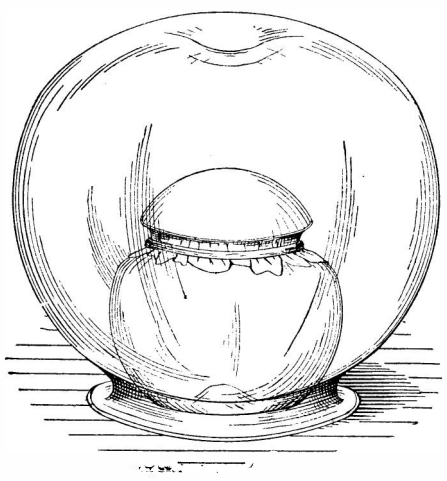


Fig. 2.—PRESSURE BY ENDOSMOSE.

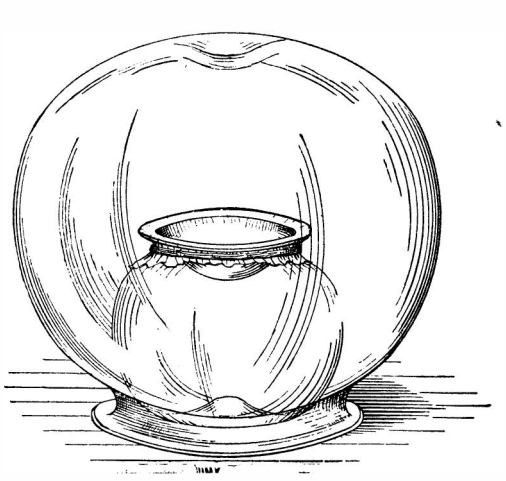


Fig. 3.—PARTIAL VACUUM BY EXOSMOSE.

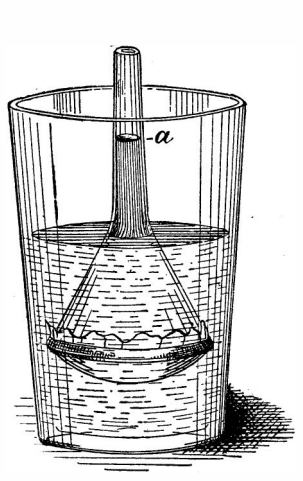


Fig. 4.—ENDOSMOMETER.

THE SPECTACLED VIPER.

The menagerie of reptiles of the Paris museum is at present in possession of three specimens of the serpent called the cobra or spectacled viper (*Naia tripudians*, Merrem). One of these was brought from Ceylon several years ago by Mr. Errington, while the two others, which are of remarkable size, have been obtained very recently, and came from Calcutta.

The cobra has attracted attention in all ages, not only on account of the peculiarity of its markings, whence it derives one of its names, but especially from the singular attitude that it assumes when excited, and from the number of victims that it annually makes. It is related to the *Elaps* (harlequin snake), and, like it, belongs to the colubriform group of venomous reptiles.

It has an elongated, rounded body, slightly inflated in the middle, and the head is of the same size as the neck, so that, when at rest, the animal has the aspect externally of an adder. As with the latter, the top of the head is covered with large scales arranged in a similar manner. When excited, it immediately raises the fore part of its body, while at the same time it dilates its neck into a broad membraneous disk, convex on the dorsal side, at the extremity of which is situated the horizontally directed head. The dilatability of the neck, which has given the serpent the name of *Cobra de capello* (hooded snake), is due to the great length and slight curvature of the cervical ribs. These, directed backward and applied to the sides of the vertebral column during repose, take, at the moment the animal is excited, a transverse direction, through the action of muscles under the control of its will. The skin in the region of the neck is thus distended into a broad, elongated disk, which the posterior extremity of the head joins in front and upon which the scales, separated from one another through the effect of the distension, and having light colored intervals between them, present the aspect of a network of which they occupy the meshes. When the excitement ceases, other muscles draw the ribs back to their first position, and the neck resumes its ordinary form.

The mouth is very wide, and the upper jaw, on each side, is provided in front with an immovable venomous fang, followed by one or two small, smooth teeth. In most cases, the general color is a uniform dark brown and almost black, sometimes marked at the sides with transverse white striæ. In a state of distension, the neck exhibits two white blotches above, which are roundish and symmetrical and have a black center, and are connected on the posterior side by a white, black bordered arch, the convexity of which is turned backward. The whole arrangement offers the aspect of a pair of spectacles, and has obtained for the animal one of the names that it bears. The anterior portion of the ventral surface is whitish and marked with one or more transverse black bands.

Two of the museum specimens are colored in this way. In one of them, however, the fundamental color is not so dark, and in the third it is of a very pale brown. The characteristic cervical blotches are frequently more or less effaced or modified in form, or even entirely absent.

The spectacled adder attains considerable size. The largest of our specimens has a length that may be estimated approximately at five feet; but, among the natural products exhibited by the Cingalese at the Garden of Acclimation, two years ago, there was a cobra's skin whose length beyond a doubt exceeded six feet.

The serpent is oviparous, that is to say, the development of the embryo is effected wholly within the body of the mother, and the egg is not laid until that is finished. The covering of the egg is then a very thin, weak membrane, which the young animal promptly ruptures immediately after the egg leaves the mother's body.

The cobra inhabits the Indies, Bengal, Siam, Cam-

© 1888 SCIENTIFIC AMERICAN, INC.

bodia, Cochin China, Tonkin, Annam, China, Malabar, Ceylon, and the principal islands of the Indian Archipelago, Sumatra, Java, Borneo, and the Philippines. Up to the present, it has not been found in the Celebes or the Moluccas. In the eastern parts of Asia, in Afghanistan and in Persia, it is replaced by the *Naia haje*, which likewise inhabits the greater part of Africa, and especially Egypt, where, under the name of asp, it has played a role no less celebrated than its congener in the Indies.

The cobra keeps itself habitually in the trunks of old trees, in ruined walls, in piles of stones, and in bamboo brush. It seems to seek the vicinity of man, where it perhaps more easily finds the small rodents that form its principal food. It is especially at sunset or during the night that it emerges from its retreat to seek food. It seizes not only small mammals and birds, but also lizards, frogs, toads, and fishes. The batrachians just named, along with rats and mice, constitute the exclusive food of the museum specimens. The cobra willingly climbs up roofs with the hope of surprising some animal there. It has sometimes been observed on the top of cocoanut trees hunting for birds. It is a good swimmer and frequents watercourses, and it has even been met with at sea at a great distance from the coast. It attacks its prey in the manner that adders do, by seizing, and at once swallowing it, without encircling it with its coils in order to crush it, as boas do, and without waiting for it to die after injecting its poison into it.

It is extremely irascible, and, provided that it is excited, it dilates its neck, turns its head to the left and right to see where the danger is, and then pounces upon its enemy with the rapidity of an arrow, and at the same time emits a sound analogous to that made by blowing into a narrow tube, whence the name of spitting serpents, given to the Naias in general. This appellation, due to the notion that the Naias first project their saliva or even their venom upon the enemies that they attack, is but partially justified by facts. Observation of specimens kept in captivity shows that, in the conditions that we have just supposed, the respiration is quickened, the inspirations are deep, and the body alternately expands and contracts. An abrupt expiration coincides with the animal's attacking motion, and causes the noise mentioned above. The expelled air is evidently capable of carrying along a little saliva (although we have never verified this), but this is a thing not peculiar to the Naias.

The cobra is the most widely distributed of venomous serpents in the countries that it inhabits, and, as its poison is very active, it annually causes, especially in the Indies, a large number of deaths. So it is justly dreaded by the natives. Its nocturnal habits and its tendency to approach dwellings still further increase the danger, by rendering its vicinage more immediate. It is even said to introduce itself under the floors of houses. Cases are relatively rare in which persons who are bitten become cured outside of any treatment. The Hindoos, and particularly the snake charmers, possess various empiric remedies, whose secret they keep, and which, according to the accounts of travelers, are not always devoid of efficacy.

The curious, graceful, and haughty attitude assumed by the cobra when irritated, and the subtle and so often mortal venom that it secretes, have very naturally exerted a profound impression upon the mind of the poorly enlightened nations among which Nature has confined it. They have regarded it as a mysterious being favored by Buddha himself for having protected him against the rays of the sun when he descended to earth, its malevolent power being designed to avenge the injuries done to the divinity. Governed by a superstitious fear, they have spared its existence, and surrounded it with a respect carried to veneration. Volumes might be filled with the legends and stories, more or less veracious, to which it has given rise.

In the Indies, all the mountebanks are provided with cobras, which they exhibit to the public for pay, and it appears that the industry is quite lucrative. The charmers are capable of rendering the animal harmless, at least for a certain length of time, by breaking off its fangs by means of a bit of cloth that they hold out to it and then pull back suddenly after it has seized it. Well authenticated cases are cited in which the serpents used by jugglers had their venomous fangs intact. After a more or less prolonged training, the charmer ends by exerting upon his subject a genuine and very curious power. The people consider such power as magical and supernatural, and the Brahmins carefully keep them in this belief.

The cobra seems to be completely subjugated, fascinated, and submitted to the will of the charmer. Under the influence of the monotonous and slowly drawn tones of a small flute, the snake performs cadenced motions. Certain touches suffice to throw it into a state of lethargy, and at certain orders it becomes as stiff and inflexible as a rod, while a few signs cause it to resume all its flexibility. These facts, affirmed by authors worthy of belief, merit being submitted to verification by science. In the meanwhile, let us remark that the processes employed by the charmers much resemble those used by physicians to produce hypnotism, and that the phenomena observed have much analogy with those seen in the hypnotized, and that perhaps they are of the same nature.—*La Nature.*

Microscopy.

One of the most comical things that we have seen in a long time, says the *National Druggist*, was a United States internal revenue agent, who came into the office of the editor a few days ago, armed with the new microscope which the department has dealt out to the agents charged with enforcing the law in regard to butter and lard adulterations. The official, a polished and educated gentleman, was in a heap of trouble. He had that morning received the instrument and the book of instructions accompanying it, and several hours of wrestling with both had thrown him into a state of mental and physical anguish, from which he sought relief. He had brought the apparatus along and wanted to know how to use it. The microscope, a new fashioned cheap affair, fitted with French or German triplets, looked more like an old time candlestick than anything else, the slide being inserted in the base and illumination obtained by directing the instrument bodily toward the source of light. It was accompanied by a polarizing apparatus, which was to be inserted in the base after the manner of the slide. After this had been done the instrument would no longer stand upright, and when laid on its side, after the fashion of such things, it would persist in rolling off the table. As dents in it showed, this must have happened several times during the few brief hours in which it had been in use. We know it happened three or four times within the hour or so that the gentleman was wrestling with it while in our office.

The "book of directions" informed the official that he was to pull out one tube "about five-eighths of an inch" and another "about three-quarters of an inch," and then he was to smear a little of the grease under examination on a slip, cover it with a cover glass, and insert the slip in the instrument, turn the polarizer, and if he saw nothing the specimen was lard or butter (we forget which), but if he saw something it was not lard or butter. These are not the words, but convey *the sense which the agent was able to extract out of them.* After some examination of the apparatus, and the exercise of a little patience, we were enabled to show the official how the thing was intended to work. Whether he will ever be able to make any use of the apparatus and the information thus gained is quite another thing. The idea of sending out men entirely ignorant of microscopy, and armed with contract toy microscopes, to determine questions which are even now matters of controversy among experts, is one which would be supremely ridiculous were it not such an outrageous travesty upon science and common sense. It is, however, an illustration of the prevalence of the idea that all that is necessary to make a microscopist is to own a microscope.

Removal of Filaria from a Horse's Eye.

A Baltimore letter to the Atlanta *Constitution* says:

Recently Dr. Thomas W. Spranklin, assisted by Veterinary Surgeon John S. Colton, successfully removed a living worm or "snake" from the eye of an old mare belonging to Mr. Stansberry, of Patapsco Neck, Md. The animal, a dark bay, about fifteen and a half hands high, has been in the stables of Rice & Marshall, on North Frederick Street, for several days, and has attracted a good deal of attention from the curious. The parasite, technically known as filaria oculi equinus, was three inches long and had the general appearance of a piece of gray silk thread. It had its abiding place in the aqueous humor of the mare's left eye, and was in a state of incessant motion, wriggling about after the manner of the animalcules seen in a drop of water under a microscope.

It was first noticed in the mare's eye about six months ago, when it was so small as to be barely discernible. It grew steadily until it attained its present size. It was never still a moment, but kept up its activity without pause day or night. The poor old mare was kept in a state of perpetual nervous excitement by it, and wasted away till her ribs protruded through her rusty coat, and her flanks were as thin as it was possible for anything of flesh to be. Many showmen visited her and offered to buy her for exhibiting purposes, but her owner would not sell.

Dr. Spranklin began his operation by securely binding the old mare so that she could not move, and then laid her down on her right side. Then her left eye was treated with a solution made of ninety-three parts of rosewater and seven parts of cocaine. Small quantities of this solution were dropped into the eye, at intervals of five miuutes, seven or eight times, until partial anæsthesia was obtained and it could be touched by the finger without pain to the animal.

Then an incision was made in the eye from the outer canthus or corner, between the cornea or eyeball and the sclerotic coat or white of the eye. The incision was made at about right angles with the eyelid, and so that it would be almost wholly covered by it when in its normal position. The instrument was kept in the wound until the aqueous humor had exuded. Then it was still retained in position, and used as a guide for a pair of very delicate spring forceps, whose blades were inserted into the opening.

The lance was then removed, and Dr. Spranklin, placing the index finger of his left hand upon the opposite side of the cornea, gently but firmly pushed the parasite toward the blades of the forceps. It was so very active that four or five times it wriggled away from their grasp. At last he was able to get a tight hold upon it and draw it out. It was very lively and lived for several minutes, in fact, until it was placed for preservation in a small vial of alcohol. The lips of the incision were drawn together and closed in a flap, the aqueous humor again flowed into and filled the cornea, and in less than three-quarters of an hour the old mare was back in her stall eating as calmly as though such a thing as a delicate surgical operation was beyond her ken.

Dr. Spranklin is firmly of the opinion that unless inflammation should ensue from want of proper nursing of the eye, it will soon be as well as it ever was, both in appearance and strength of sight. As to how the worm got into the animal's eye, he inclines to the idea that its germ was taken into the mare's system through water which she drank.

Curious Doings of Lightning.

A telegram from Crescoville, Pa., says: During the thunder storm that visited this region July 9, a maple tree in front of Miner Cresco's residence was struck by lightning. The only damage done to the tree was the splintering of a piece out of the trunk, midway between the ground and the lower branches. After the storm was over, Mr. Cresco went out to look at the tree. On the ground at the foot of it lay an immense black snake dead, and holding in its mouth a young robin. There was a robin's nest in the tree, and it was known to have had three young ones in it. As the tree had been struck by lightning, it was supposed that they had been killed. A boy went up the tree and found two young robins in the nest, alive and lively. It is supposed that the black snake had climbed the tree and robbed the nest of one of the newly hatched birds, and was descending the trunk as it was struck by lightning and killed with its prey in its mouth. The lightning thus avenged the robin.

A dispatch from El Paso, Texas, says: On the night of the 4th of July, this city and vicinity was visited by a thunder storm which, in the amount of electricity discharged, was unprecedented in this section. One of the peculiar manifestations of the lightning was in the striking of a tree under which a flock of goats had taken shelter. Fifty-two of the animals were killed, but only a slight trace of the lightning could be noticed on the tree.

Increase of Russian Home Industries.

The British Consul-General at Warsaw, Russia, states that the increases which are constantly being made in the Russian duties are having a serious influence in preventing imports into Russia, and German trade has suffered severely in consequence. The consul, reporting on the trade of last year, also points out that business with Great Britain has also decreased, there being a noticeable falling off in fancy cloths, Manchester cotton velvet, jute, felt carpets, cocoanut mattings, Nottingham curtains, leather and cotton beltings, Birmingham goods, Sheffield cutlery and tools, agricultural machinery and implements, leather for bookbinders, earthenware, and glass. There is also a decrease in cotton yarns and twist, knittings, Irish linen, chemicals, and aniline dyes. The only articles which seem to have held their own are power looms and spinning machinery. The consul further states that in consequence of the diminished importation of foreign manufactured goods, many small manufacturers in Warsaw have lately taken to producing articles which were formerly obtained from abroad, such as pins and needles, leather goods, umbrellas, cravats, silk ribbons, stays, etc., also silk, cotton, woolen, and kid gloves, felt and straw hats, small iron wares, tin goods, buttons, ready made clothes, knitted goods, musical instruments, toys and dolls, basket goods and carpets. Warsaw is, in consequence, rapidly becoming an industrial center.

New Naval Observatory at Washington.

The contract for the erection of the new Naval Observatory buildings, on Georgetown Heights, near Washington, has been awarded by the Secretary of the Navy for $307,811. This contract does not cover the piers or the domes, which are to be built by experts under the direct supervision of the observatory officers. There are to be nine buildings in all, including the main building—the great equatorial building, where the great telescope will be mounted; the clock room, where the observatory clock will be set up and the naval chronometers kept and corrected; two buildings for observers' rooms; the east and west transit buildings; and a boiler house. The material used will be Tuckahoe marble. Work is to be begun immediately, and the buildings are to be completed within eighteen months.

© 1888 SCIENTIFIC AMERICAN, INC.

THE SWINGING OF CLUBS.

The oldest weapons of man are clubs, that is, strong, thick cudgels, such as are still used by savages. Clubs played an important part in the heroic legends of ancient times, for their bearers accomplished wonders with them. The Greek hero Hercules, who was endowed with supernatural power, was called the "club bearer," and tradition also tells us that Theseus swung the club in the most powerful manner. In old times the Jews, the Philistines, and the Egyptians, as well as the inhabitants of Northern Europe and Britain, were specially renowned for their use of the club, which was also used as a weapon by the Germans. At the time of the Crusades the inhabitants of Asia knew how to use this weapon effectively. In the battle of Askalon, August 14, 1099, 5,000 Ethiopians armed with iron clubs offered a desperate resistance to the victorious Christians. Later the club was much used by the Italians, and King Philip Augustus of France (1180 to 1223) provided his body guard with clubs. With the progress of culture the use of the club as a weapon has disappeared among civilized nations, giving way to other and more destructive means of defense.

Lately clubs have found favor here in Germany, not as weapons, but as a means of exercising. Wooden clubs are swung in gymnasiums as well as in ordinary rooms for the purpose of bringing the different members into motion by a gradually acquired skill, and thus strengthening the body. The club is not a simple weight, the form of which is immaterial in obtaining these motions, but should be of a peculiar shape which is adapted to the end in view, that is, a form suitable for swinging is of more importance than weight. Therefore, one does not speak of practicing with clubs, but of swinging clubs. If the swinging of clubs is to have the desired effect, it is necessary that their length, diameter, and weight should be suited to the bodily strength of the person who is to use them, and for this reason clubs having a diameter of from 3 inches to 6 inches, and a length of from 15 inches to 30 inches, are recommended as best. To ascertain the right weight, one should take the club by the neck and raise it in front of him or at his side. When raising it in front of him, the outstretched arm should be raised as high as his shoulder, and when raising it at his side it should be lifted sidewise as high as his shoulder. If a club can be held in either of these positions for 30 seconds without strain, it is of about the right weight. For beginners, clubs weighing from 2 to 3 pounds are the best, and they can be made heavier after continuous practice, by pouring in lead.

All club swinging is based upon the hand circle and the arm circle. Before beginning to exercise regularly with clubs, lifting, thrusting, and swinging (Figs. 1, 2, and 3) should be practiced. This should be followed by the arm circle with either one or two clubs (Figs. 4, 5,

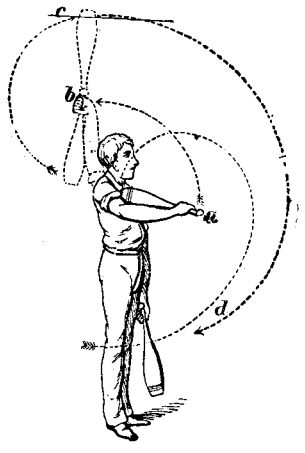


FIG. 1.—Tipping toward the body while lifting, turning upward, and then tipping down while lowering the arm.

FIG. 2.—Swinging diagonally downward with the right and diagonally upward with the left.

FIG. 3.—Sidewise swinging with a lunge to the opposite side and alternate bending of the knees.

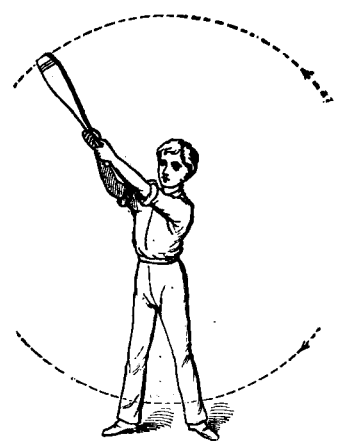


FIG. 4.—Arm circle to the right in front of the body, both hands on one club.

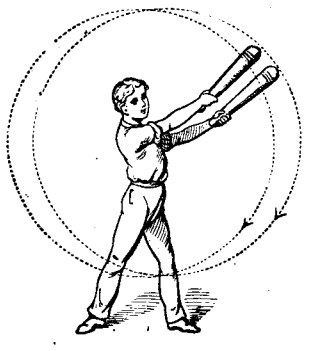


FIG. 5.—Arm circle to the left with both hands in front of the body.

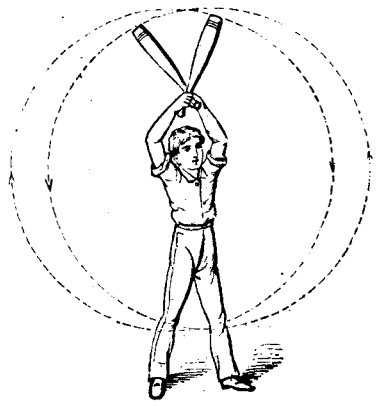


FIG. 6.—Arm circle in front of body, both arms thrown inward or outward.

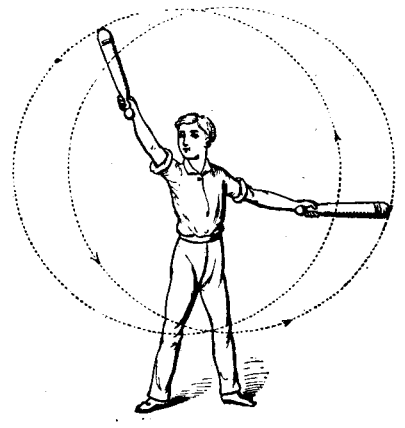


FIG. 7.—Arm circles with one arm in front of the other.

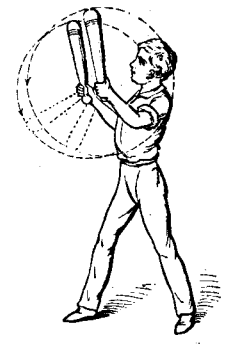


FIG. 8.—Hand circles, forward, outside of the arms.

FIG. 9.—Hand circle forward between the arm and the body, and backward between the arm and the head.

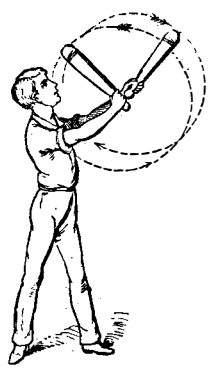


FIG. 10.—Hand circles forward and backward outside and inside of the arms.

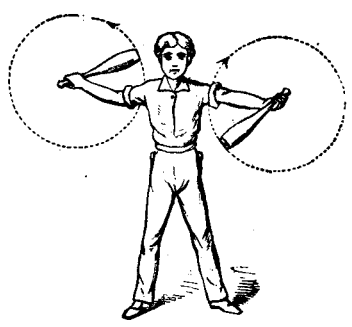


FIG. 11.—Hand circle toward the right (outward) behind the arm, and toward the left (inward) in front of the arm.

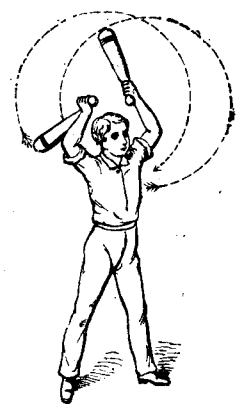


FIG. 12.—Hand circles behind the head.

FIG. 13.—"Eight" in front of the body, both hands on the club.

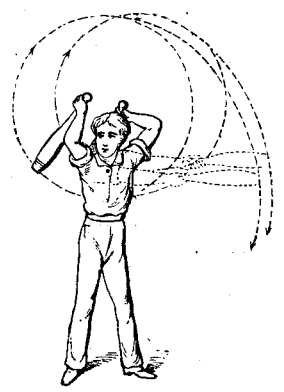


FIG. 14.—Hand circles backward behind the head, and arm circles forward in front of the body.

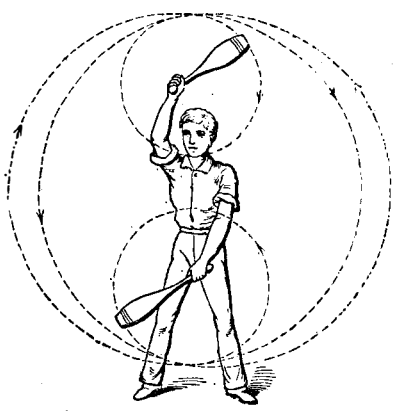


FIG. 15.—Hand circles in the lowest and highest positions, and arm circles in front of the body.

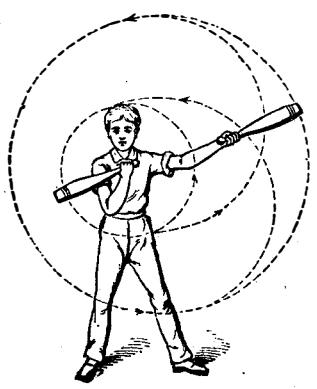


FIG. 16.—Arm circle in front of the body, toward the left, inward, and hand circle toward the left, inward, at the same time.

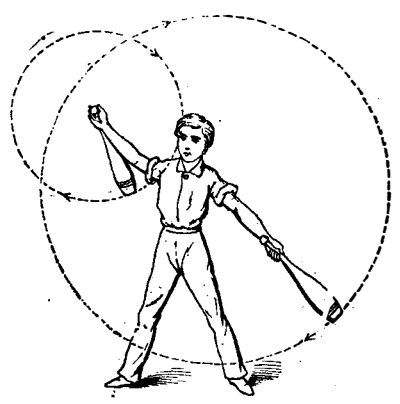


FIG. 17.—Hand circle to the right behind the arm, and at the same time arm circle to the right in front of the body.

FIG. 18.—Arm and hand circles outward.

© 1888 SCIENTIFIC AMERICAN, INC.

6, and 7). The hand circle (Figs. 8, 9, 10, 11, 12, 13) presents greater difficulties. The combination of the hand and arm circles completes the course.

The best wood for clubs is white beech or elm; oak is inclined to be brittle and is apt to crack, it is also expensive. Polish is not necessary, but a coating of varnish is recommended. When swinging clubs, such clothing should be worn as will allow a free movement of the limbs, and when exercising in a room care should be taken to admit plenty of good, fresh air. The best time for exercising is before dinner, and after swinging the clubs the muscles should rest for at least a quarter of an hour, as the excitement of the muscles would be a hinderance to the digestion of the meal to be taken. If violent exercise causes palpitation of the heart or rapid breathing, the clubs should be laid aside. The swinging of clubs cannot be too highly recommended to those who lead a sedentary life, and men whose time and occupation do not permit of their attending a gymnasium—for instance, teachers, civil officers, merchants, etc.—should have a room in their dwellings where they can practice with clubs.—*Illustrirte Zeitung.*

The Use of Water at and before Meals.

Opinions differ as to the effect of the free ingestion of water at meal times, but the view generally received is probably that it dilutes the gastric juice, and so retards digestion. Apart from the fact that a moderate delay in the process is by no means a disadvantage, as Sir William Roberts has shown in his explanation of the popularity of tea and coffee, it is more than doubtful whether any such effect is in reality produced. When ingested during meals, water may do good by washing out the digested food and by exposing the undigested part more thoroughly to the action of the digestive ferments. Pepsin is a catalyptic body, and a given quantity will work almost indefinitely, provided the peptones are removed as they are formed. The good effects of water, drunk freely before meals, have, however, another beneficial result—it washes away the mucus which is secreted by the mucous membrane during the intervals of repose and favors peristalsis of the whole alimentary tract. The membrane thus cleansed is in a much better condition to receive food and convert it into soluble compounds. The accumulation of mucus is specially marked in the morning, when the gastric walls are covered with a thick, tenacious layer. Food, entering the stomach at this time, will become covered with this tenacious coating, which, for a time, protects it from the action of the gastric ferments, and so retards digestion. The viscid contents, a normal condition in the morning before breakfast, is not suitable to receive food. Exercise before partaking of a meal stimulates the circulation of the blood and facilitates the flow of blood through the vessels. A glass of water washes out the mucus, partially distends the stomach, wakes up peristalsis, and prepares the alimentary canal for the morning meal. Observation has shown that non-irritating liquids pass directly through the "tubular" stomach, and even if food be present, they only mix with it to a slight extent.—*The British Medical Journal.*

How Machine and Watch Oil is Secured.

At the recent opening of the Horological School at La Porte, Ind., on February 2, 1888, Mr. Wm. F Nye, of New Bedford, gave an interesting lecture, from which we abstract the following:

All wheels need greasing, and the little wheels of the watch are no exception; the proper oil is just as essential to them as the sperm oil to the great Corliss engine that kept in motion the acres of machinery at our late Centennial Exposition, and is now the great motor assisting in working out a great nation's destiny in the thriving city of Pullman, near Chicago.

I have been asked to tell you something that my twenty years' experience may have taught me about greasing these wheels; where and how down on the Atlantic coast we get and prepare the proper oils for watch and clock use. I will not attempt this on any technical or scientific basis, for science yet despairs of defining the varied properties of oil from the different species of fish. When the scientists can tell us where the rose and the lilac gather in spring time their beautiful colors and grateful perfume, they may be able to tell us more than we now know about oils. It is yet as puzzling as the well known fact among horologists that a watch will not keep the same time with two persons. Electric conditions, varying temperature of body, and difference in motion affect the watch; and so it is with the properties of oils from the inhabitants of the vast oceans, stretching from the ice-fettered poles and across the torrid belts, conditions as widely vary with them.

In all my observation of food of fishes, and study of the same during passages I have made over the three great oceans, my theory is (for the naturalist may dispute me if I call it else than theory) that the species of fish that take their food in the sunlight on the surface of the ocean generate a very superior oil, and in most species hold it in reservoirs about the head, and afford us an oil of finer texture for lubricating purposes, while those that root out the bivalves from the grand banks of Newfoundland or the shifting sands along our coast, and delve into the dark cave of ocean for kelp and mollusk, as their food, furnish but an indifferent oil, fit only for the currier's use or the miner's lamp.

Doubtless the tender Mother Carey's chicken and tireless albatross, ever upon the wing over the southern oceans, become food for many, while others forage amid the immense schools of sardines and herring that annually migrate past the maelstrom of Norway, while yet others, like the sperm whale and its smaller cousins, the *black fish* and *porpoise*, sport and tumble in warmer seas on both sides of equator, skimming the animalcules, the sun fish, jelly fish, and squid that a tropical sun awakens to life.

Down on the coast, "down East," as you would say, the term "happy as a clam at high water" is familiar. The clam loves a deep sea over his sand bank home, but like our friends in Dakota, he is often disturbed by blizzards and gales, and the heavy sea rolls them in windrows from their snug beds, when the swarming schools of cod, hake, and haddock do not wait for an invite to the feast, and our fishermen declare that in a few days after a gale they become remarkably fat, and these are furnished by your grocer as the codfish *par excellence* to roll with your potato into the very relishable fish ball. Not so with our fishes of fine watch oil fame, the *black fish* and *porpoise*. They bask and sport in the sunbeams, where the myriads of small fish seek their life. Like the locusts that we have learned visit our forests once in seventeen years, there come to our New England shores, at long intervals, vast schools of a little fish called the squid, though the latter make us two visits to the locust's one, coming at intervals of nine years, so that our hardy fishermen of Cape Cod and Cape Ann very safely reckon the time for "another haul," as they term it, of black fish, that are sure to follow the squid. In the last school that came to us, in November, 1884, which proved the largest ever known in the history of sea fishing, 2,200 were taken, and, in all probability, but few of that school that entered Cape Cod Bay escaped, as it is computed fully 600 boats "lent a hand" in the pursuit and capture. The presence of the little squid, that swim either end foremost, first attracts the attention of the fishermen, who are out in their boats from every inlet along the coast when the watchword is given, "Black fish are coming!" and ere long they "break water" in the outer bay. Boats are now manned with extra crews, armed with harpoons, knives, and hooks. General Grant tactics of "flanking them" are adopted. They get outside and around the unwary fish, so eager for their prey, and slowly "shoo" them into shallow water, bayou and creek; and when a few, touching the shore, begin to fluke, others will follow, presumably to see what is the matter, when overboard go the men from the advance boats, and the slaughter commences. Only a portion of the school are obtained at this time.

A separate portion are driven in other inlets, where they are held till the tide recedes, when they are butchered, and by a strong hook and line drawn by a gang of men to where the "whale cast Jonah." Many days elapsed before this school of 1884, of which I speak, were all taken, and divisions of it were secured from Provincetown to Barnstable, a distance of fifty miles.

We were early upon the scene to share in this "streak of fisherman's luck," for we were at the time lamenting our very short supply of the particularly fine oil yielded only by the jaws and heads of these fish, to enable us to maintain the reputation of Nye's watch and clock oils; and the first train took us along these sandy shores, where the pilgrim fathers had traveled and braved a stormy winter, just 264 years before. The scene was, well, not to say beautiful, at such slaughter of an ocean tribe, but it was not a little picturesque and exciting. Everybody "took a hand" and "came in for a share." Our time had come. We bargained and arranged for the heads of these fish, the greater part of which it was our good fortune to secure, and proceeded at once to cut the "jaws" and so-called "melon," which is much in the shape of a half melon on either side of the head, and from which the name is derived. It was not only the largest, but in every way the finest, lot of watch and clock oil stock ever secured. It seemed to have come, too, at a time when the immense production of watches and clocks the world over demanded a better and more abundant supply of reliable oil adapted to their requirements. An important peculiarity of this oil, and in which it differs from all others, is that it improves by age, a phenomenon proved by long experience in preparing it for use and accounted for by alternate gathering and emission of moisture upon exposure to changes of temperature, as by this and after treatment it does in time become permanently clear and brilliant, and in consequence of which we seldom use it in the same year obtained.

Amid our processes of preparing this oil, especially for the watch and clock trade, we find that filtering at a very low temperature is the one thing most essential, and as, in the latitude of New Bedford, where our factory is situated, we are seldom favored with temperature below zero, we have established a plant on the borders of Canada, at St. Albans, Vt., where we "chill it down" and render it brilliant at an average temperature of 25 degrees below zero. Last year we were able to filter at 37 degrees below. By this process we discover that with reduction of temperature the specific gravity or density of the oil increases and finer grain and texture are secured, giving increased resistance to the effects of both heat and cold, and especially to the changing conditions of the body upon watches carried in the pocket, and assuring in an eminent degree the non-drying properties so essential to a lubricator for accurate timers.

At no time in the preparation of these oils do we use acids or alkalies, but retain them in their native purity to the fullest extent. Extreme care is used in cutting out the "jaw melon," that no blood may come in contact with the parts, for blood engenders an acid that soon permeates the oil; neither is any of the outer black skin of the fish allowed to go into the kettles in the process of rendering, as it imparts a discoloration that can only be extracted by caustic and sun bleaching, which unfits the oil for use upon the delicate parts of fine watches. As I have said, our improved processes of refining these oils at a very low temperature free them perfectly from all impurities that corrode and blacken the pivots of a watch, and cause them to be entirely unaffected by heat and cold.

In regard to oils prepared for watch and clock use from vegetable or animal oils, every attempt has proved a failure. I very thoroughly investigated this during my trip over Europe last year, where every oil I met with, save our American oils, was more or less prepared from the olive or joints of animals, and our importers of French and German timers are now protesting against the further use of European oils upon goods sent them. They quickly evaporate, and corrode or gum upon the watch.

The Diet of Different Peoples.

The vagaries of the appetite are far beyond the explanatory science of physiology. What we call tolerance in medicine is in itself a mystery. We cannot tell why this thing agrees with this individual and at the same time utterly destroys his brother. The trite old saying that one man's meat is another man's poison must be accepted empirically. Still less can we account for the variations of taste. Why one man's gustatory nerve should respond agreeably to salt, while another's repels it with violence, we cannot understand. Doubtless, education has most to do with it, and yet the manner in which education operates continues a mystery. The preference of the Chinese for food that seems to our appetites absolutely disgusting is well known. In Canton, rats sell for fifty cents a dozen, and dogs' hind quarters command a higher price than lamb or mutton. Fancy, eating birds' nests worth $30 a pound! This is what a mandarin revels in. The French have beguiled us into eating frogs' legs, which were once tabooed in this country, and we have even come to esteem diseased goose liver in the form of *pate de foie gras.*

The writer has met Brazilians who rave over boa constrictor steaks, and count monkeys and parrots a very good meal. In the West Indies, baked snake is a common dish, as the reptiles abound, and it is a good way of getting rid of them. But when it comes to frying palm worms in fat, one would think the stomach would rebel. It is not so, however, though, by a strange inconsistency, stewed rabbit is looked upon with disgust. On the Pacific coast the Digger Indians eat dried locusts, and in the Argentine Republic skunk flesh is a dainty. Our own favorite bivalve, the oyster, is very disgusting to a Turk, while the devil fish, eaten in Corsica, is equally so to us. We cannot understand, either, how the inhabitants of the West Indies and the Pacific coast can eat lizards' eggs with a relish; still less, how the eggs of the turtle and alligator can become a favorite article of diet. The Brazilians eat ants, probably to get rid of them, for they literally infest the country, and are of an enormous size. It is easy to pick up a handful of ants almost anywhere, though the wary do not go about it in this way, as the pestiferous insect bites in a most vicious manner. A curry of ants' eggs is a great delicacy in Siam, and the Cingalese eat the bees whose honey they have stolen. The Chinese, who seem to have stomachs like the ostrich, eat the chrysalis of the silkworm after unwinding the cocoon. Spiders are used in New Caledonia as a kind of dessert, while caterpillars are also relished by the African Bushmen.—*Philadelphia Medical Register.*

Mosquito Fumigating Pastilles.

Charcoal	1 lb.
Saltpeter	2 oz.
Carbolic acid	1½ "
Persian insect powder	8 "
Tragacanth mucilage	q. s.

To clear a room of mosquitoes, take a small piece of gum camphor in a tin vessel and evaporate it over a flame, taking care it does not ignite. A sponge dipped in camphorated spirits and made fast to the top of the bedstead will be found serviceable in the sleeping room. Decoction of pennyroyal, applied to the exposed parts, will effectually keep off these troublesome insects.—*American Pharmacist.*

© 1888 SCIENTIFIC AMERICAN, INC.

ENGINEERING INVENTION.

A system and apparatus for heating and lighting cars has been patented by Mr. George Smith, of Rochester, N. Y. A compressed air reservoir is connected with a naphtha tank, a pipe from which leads to the heater and lamps for supplying carbureted air, while there is an automatic cut-off by which the supply of gas is cut off to prevent danger from fire in case of accident.

AGRICULTURAL INVENTIONS.

A corn harvesting and husking machine has been patented by Mr. John A. Hilbert, of Carroll, Iowa. This invention covers an improvement on a former patented invention of the same inventor, the machine cutting the stalks, separating the ears and husking them, and delivering them to a wagon traveling with the machine, while the stalks are placed in a row or a pile on the ground.

A mower has been patented by Messrs. Robley D. Hoke and Isaac A. Harris, of Wessington, Dakota Ter. It has an improved driving mechanism, and an adjusting mechanism designed to drive the sickle bar with a sufficient number of strokes to secure a perfect cut of the grain in proportion to the advance of the machine, the machine also having a simple and practical means of adjusting the shoe of the sickle bar.

MISCELLANEOUS INVENTIONS.

A button has been patented by Mr. Charles A. Peirce, of Dover, N. J. It is a collar button having attached means for securing and engaging the necktie, and consists in a hinged pointed pin combined with a collar button.

A shoe fastening has been patented by Mr. George H. Coursen, of Baltimore, Md. It is made of a sheet metal strip, bent and closed for attachment to a shoe or other article of wear to make an eye-like fastening, adapted to receive a lacing cord or shoe string freely through it.

A cement has been patented by Mr. Isaac C. Hatch, of Santa Cruz, Cal. It is made of stated proportions of lime, sand, coralline, and sugar, finely ground and thoroughly mixed, and is said to be particularly well adapted for building heavy walls of either brick or stone.

A stove has been patented by Mr. Hans Lindas, of Stoughton, Wis. This invention relates to parlor stoves adapted for heating separate rooms, and wherein provision is made for cooking or baking, and is designed to afford an improved construction in which the smoke is utilized as a heating factor.

A commode has been patented by Mr. William R. Wythe, of Santa Barbara, Cal. This invention covers a novel construction, combination, and arrangement of parts, constituting a commode easily discharged of its contents, not liable to become offensive, and which is protected against freezing.

A coffee pot has been patented by Mr. William Racer, of Harrison, Ark. A funnel with cylindrical lower end and strainer in its bottom is supported inside the pot, in combination with an interior perforated cylinder, holding the ground coffee, affording a pot specially designed for making coffee by percolation.

An ore jigger has been patented by Messrs. William B. Hodgson and Truman C. Safford, of Lyon Mountain, N. Y. This invention covers an improved screen to facilitate the sizing of wet and dry ores, the screen being convex or conical, and supported directly over the upper end of a hopper by a vertical shaft revolving in the casing.

A rowing apparatus has been patented by Mr. Robert Masay, of Nashville, Tenn. Combined with a frame or support are pivoted bearer plates to which oars are held, the frame having a sliding bar and means for locking the parts in position, with other novel features, whereby boats may be propelled and steered without directly handling the oars.

A cut-out for electric light circuits has been patented by Mr. Charles D. Wright, of Petersburg, Ill. It is designed to throw a suitable amount of resistance into the circuit when the current therein becomes abnormal, and before the regulating devices connected with the dynamo can act, thereby avoiding the burning out of the armature of the machine.

A composition for roadways has been patented by Mr. Louis N. Beauchemin, of Hancock, Mich. It is intended for use as a top layer or facing upon other layers of other materials, and is made of specified proportions of black pitch, coal tar, resin, copper moulding, stamp sand, and other materials, compounded and applied as described.

A combined school seat and desk has been patented by Mr. Albert Landon, of Rutland, Vt. The seat is located in front of the desk, which forms a back for the seat, the seat being adapted to fold up beneath the desk and behind its back, the seat being easily adjustable in and out of position to afford a passageway between rows of desks.

A hand punch has been patented by Mr. William Yates, of New York City. It is for canceling, numbering, dating, or otherwise marking railway tickets, etc., and the invention covers novel features of construction and arrangement of parts, whereby a great variety of combinations for marking and punching may be effected.

A combined freight bucket and truck has been patented by Mr. Louis A. De Mayo, of Jersey City, N. J. This invention provides a novel construction whereby freight may be conveniently carried from one portion of a warehouse to another, wheeled along a dock, or be hoisted from floor to floor, etc., or may be readily dumped from the bucket without moving or tilting the truck.

A tool post ring has been patented by Mr. William S. Cobb, of Philadelphia, Pa. The invention consists in a series of three inclined face rings or plates fitted around the tool post and on to the tool block and on each other, and relatively adjusted to give the required set of the tool, making an attachment to tool posts or holders of lathes or shaping machines.

A nail cutter has been patented by Mr. Terence F. Curley, of Brooklyn, N. Y. It consists of a handled plate having unsharpened edges, one or both of which are provided with a V-shaped notch, the plate being sharpened at the sides of the notch to adapt it for cutting the ends of the nails, and so the nails may be trimmed without danger of cutting the flesh.

A lemon juice extractor has been patented by Mr. John L. Easley, of New York City. It has a rotary frame with vertical curved arms or ribs between which a lemon may be wedged, with openings by which the skin may be dislodged, and other novel features, whereby the juice extracted will be free from the oil of the skin, and the pulp and seeds will be caught without impeding the flow of the juice.

SCIENTIFIC AMERICAN BUILDING EDITION.

JULY NUMBER.—(No. 33.)

TABLE OF CONTENTS.

1. Elegant plate in colors of a cottage of moderate cost, with floor plans, details, etc.
2. Plate in colors, with floor plans, details, etc., for a suburban dwelling. Cost, six thousand dollars.
3. Floor plans and perspective view of a suburban cottage erected at Fordham Heights, New York City. Cost, five thousand dollars.
4. A Queen Anne, lately erected at Asbury Park, N. J. Cost, complete, fourteen hundred dollars. Perspective and floor plans.
5. Design and floor plans for a carriage house and barn.
6. Perspective of an attractive cottage at Jekyl Island, Ga.
7. Design for a small cottage costing two thousand dollars. Perspective elevations and floor plans.
8. A church at Nashville, Tenn.
9. Illustration of the Chapel of Pocito, Mexico.
10. Lich gate or cemetery entrance.
11. Page of engravings showing some attractive dwellings in Connecticut.
12. An attractive cottage lately erected at Asbury Park, N. J., at a cost of eighteen hundred and fifty dollars, complete. Plans and perspective.
13. A row of twelve hundred dollar houses lately erected at Kingsbridge, New York City. Plans and perspective.
14. Illustration of U. S. Court House and Post Office, Troy, N. Y.
15. Design for the new U. S. Court House and Post Office at Williamsport, Pa.
16. Engraving of the new U. S. Court House and Post Office, Chattanooga, Tenn.
17. View of the oldest cottage at Asbury Park, N. J.
18. Plans and perspective view of a cozy little seashore cottage lately built at Ocean Grove, N. J. Cost four hundred dollars.
19. A modern house built at Asbury Park, N. J., at a cost of two thousand dollars. Plans and perspective.
20. Illustration of the new U. S. Court House and Post Office at Oshkosh, Wis.
21. Perspective and floor plans for a pleasant cottage to cost from eighteen hundred to two thousand dollars.
22. A cottage lately built on Monroe Av., Asbury Park, N. J., for one thousand and fifty dollars. Plans and perspective.
23. Perspective view of a design for a museum, Pelz and Griebel, architects. Full page engraving.
24. Miscellaneous contents: Riche's pantograph, illustrated.—Areas of different parks.—Paint work.—Sawdust.—The chimney shaft.—The age of stars.—Wood that will not blaze.—Bricks of blown glass.—Turning and polishing marble.—Decorative joinery.—Villas and their doorways.—The law of trespass.—Water for household use.—Hydraulic mortars and cements.—The Durango tunnel.—Slate bricks.—Houses in Seville.—Shells as a decorative element.—Ancient and modern mortars.—Treatment of hardwood floors.—A selection of lilies.—Undesirable town houses.—Richmond's Victor steam heater, illustrated.—Cheap buildings in China.—Improved fans, ventilators, etc., for buildings and for mechanical uses, illustrated.—An economical steam and hot water heating boiler, illustrated.—An improved dumb waiter, illustrated.—A composite steel wire door mat, illustrated.—Domestic conveniences possible with a hand force pump, illustrated.—New variety moulder and shaper, illustrated.—How to fit up a recess.—The Boynton furnaces, ranges, and heaters, illustrated.—Cook's new extension beam trammels illustrated.

The Scientific American Architects and Builders Edition is issued monthly. $2.50 a year. Single copies, 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages; forming, practically, a large and splendid MAGAZINE OF ARCHITECTURE, richly adorned with elegant plates in colors and with fine engravings, illustrating the most interesting examples of Modern Architectural Construction and allied subjects.

The Fullness, Richness, Cheapness, and Convenience of this work have won for it the LARGEST CIRCULATION of any Architectural publication in the world. Sold by all newsdealers.

MUNN & CO., PUBLISHERS,
361 Broadway, New York.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Wanted—A thoroughly competent vinegar manufacturer. Address (giving particulars as to ability and experience), The Hamilton Vinegar Works Co., Limited, Hamilton, Ontario.

Valuable Manufacturing Business for sale. Wilson Bros. & Co. Telegraph Feed Cutters and Cider Mills, with patents, trade-marks, etc.; 50,000 in use; large demand for extras; established 30 years. Complete plant for these specialties and general manufacturing business; large foundry. Business, with exclusive rights and patterns, can be bought separate from plant. Commonwealth Trust Co., Harrisburg, Pa.

For the latest improved diamond prospecting drills, address the M. C. Bullock Mfg. Co., 138 Jackson St., Chicago, Ill. Cable address: Bullock, Chicago.

The best *Coffee* roasters, coolers, stoners, separators, polishers, scourers, glossing apparatus, milling and peaberry machines; also rice and macaroni machinery, are built by The Hungerford Co., 69 Cortlandt Street, New York.

Safety water columns. Cheaper than explosions or burned boilers. For illustrated price list, Reliance Gauge Co., Cleveland, O.

Steam Pipe Covering, Sectional and Plastic. Write for Pamphlet. Jno. A. McConnell & Co., 69 Water St., Pittsburgh, Pa.

The Diamond Prospecting Co., 74 and 76 W. Lake St., Chicago, Ill., general agents for the Sullivan diamond prospecting drills.

Nickel Plating.—Manufacturers of pure nickel anodes, pure nickel salts, polishing compositions, etc. $100 "*Little Wonder.*" A perfect Electro Plating Machine. Agents of the new Dip Lacquer Kristaline. Complete outfit for plating, etc. Hanson, Van Winkle & Co., Newark, N. J., and 92 and 94 Liberty St., New York.

Perforated metals of all kinds for all purposes. The Robert Aitchison Perforated Metal Co., Chicago, Ill.

The *Railroad Gazette*, handsomely illustrated, published weekly, at 73 Broadway, New York. Specimen copies free. Send for catalogue of railroad books.

The Knowles Steam Pump Works, 113 Federal St., Boston, and 93 Liberty St., New York, have just issued a new catalogue, in which are many new and improved forms of Pumping Machinery of the single and duplex, steam and power type. This catalogue will be mailed free of charge on application.

Link Belting and Wheels. Link Belt M. Co., Chicago.

Iron Planer, Lathe, Drill, and other machine tools of modern design. New Haven Mfg. Co., New Haven, Conn.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

The Holly Manufacturing Co., of Lockport, N. Y., will send their pamphlet, describing water works machinery, and containing reports of tests, on application.

Lockwood's Dictionary of Terms used in the practice of Mechanical Engineering, embracing those current in the drawing office, pattern shop, foundry, fitting, turning, smith's and boiler shop, etc., comprising over 6,000 definitions. Edited by a foreman patternmaker. 1888. Price, $3.00. For sale by Munn & Co., 361 Broadway, New York.

C. E. Billings' Patent Cutting-off Tools, 7 different blades. Billings & Spencer Co., Hartford, Conn.

We are sole manufacturers of the Fibrous Asbestos Removable Pipe and Boiler Coverings. We make pure asbestos goods of all kinds. The Chalmers-Spence Co., 419 and 425 East 8th Street, New York.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Friction Clutch Pulleys. The D. Frisbie Co., N.Y. city.

Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N.Y. See illus. adv., p. 28.

Rotary veneer basket and fruit package machinery. I. E. Merritt Co., Lockport, N. Y.

For Steam Heating—the Dunning Patent Wrought Iron Boiler. Over 13,500 in use. Manufactured by New York Central Iron Works, Geneva, N. Y., U. S. A.

Rollstone variety lathe—bores, beads, and turns at the same time. Rollstone Machine Co., Fitchburg, Mass.

No. 11 planer and matcher. All kinds of woodworking machinery. C. B. Rogers & Co., Norwich, Conn.

☞Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.

NEW BOOKS AND PUBLICATIONS.

ELECTRICAL INSTRUMENT MAKING FOR AMATEURS. By S. R. Bottone. London: Whittaker & Co.; and New York: D. Van Nostrand & Co. 1888. Pp. 183. Price $1.20.

This new edition, enlarged by a chapter treating of the telephone, and by various other minor features, brings this convenient manual up to date. The description of the pocket accumulator, practical notes on electro-magnets, etc., are most acceptable. We have already noticed in these columns the first edition. We can only add that we consider it a good augury that a second edition has so soon been called for.

MANAGEMENT OF ACCUMULATORS AND PRIVATE ELECTRIC LIGHT INSTALLATIONS. By Sir David Salomons, Bart., M.A., A.I.C.E. London: Whittaker & Co. New York: D. Van Nostrand & Co. 1888. Pp. 176. Price $1.20.

The results of the experience of this distinguished electrician, one who has made the study of electric lighting and home appliances a true labor of love, are in this volume given freely to the public. The work purports to be and is a practical one. No obnoxious quantity of theories and formulas encumber its pages, but what to the practical man is the real meat of the question is given by itself. It is well illustrated, and should be in the hands of every one interested in the subject of small electric plants.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

July 10, 1888,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Acetone, manufacture of, G. Rumpf 385,777
Air compressor, W. A. Pitt 386,028
Alarm. See Burglar alarm.
Album, photograph, H. Boussemaere 385,838
Alloy, D. O'Hara *et al.* ..... 385,945 to 385,955
Alloy of copper, nickel, and gold, D. H. Church 385,909
Animal trap, L. Beversdorf, Jr 385,788
Animal trap, W. D. Heltsley 386,009
Annunciator, electrical, M. M. Wood 385,894
Atomizer and inhaler, combined, A. J. & G. H. Palmer 386,025
Axle, vehicle, E. Firth 385,798
Baling press, G. Ertel 386,063
Ball curver, base, McKenna & Baker 385,816
Band cutter and feeder, E. P. Killinger 386,017
Battery. See Electric battery.
Bed, folding, F. H. Walker 385,736
Bedstead slat lock, R. D. Martin 386,022
Beer cooler, A. Aufrichtig 385,986
Bellows, valve for, J. H. Chase 385,999
Belt shipper, R. H. Hurlbut 385,718
Belting, J. B. Forsyth 385,703
Bicycle, G. T. Warwick 386,097
Bit, countersink, and screwdriver, combined, F. B. Carpenter 385,791
Blacking box, W. K. David 385,916
Blinds, etc., cord holder for holding the cords of, E. Tonks 385,829
Blowpipe flames, saturator for the production of vapor, F. E. Ives 385,934
Board. See Drawing board. Multiple switch board.
Board of composite material, A. Mack 386,102
Boat. See Life-saving buoy boat.
Boat detaching apparatus, A. McCrackin 385,866
Boiler. See Locomotive boiler.
Boiler, C. Wheat 385,830
Boiler feeder, J. E. Winder 385,893
Boot and shoe nailing machine, L. Goddu 385,802
Boot, button, F. J. Hastings 386,069
Boots or shoes, manufacture of counter stiffeners for, P. Cox 385,746
Bottle closure, W. Edmundson 385,852
Bottling apparatus, S. Bunting 385,840
Box. See Blacking box. File box. Sluice box. Tobacco box.
Box, J. D. Griswold 385,924
Boxes, manufacturing, F. A. Jones 386,074
Brake. See Car brake.
Brake shoe, F. L. Sheppard 385,966
Brick masonry, F. W. Gordon 385,804
Brick mould sanding machine, J. A. Buck 385,790
Bridges, cable system for draw, Boegen & Tepoorten 385,743
Bucket and truck, combined freight, L. A. De Mayo 385,849
Buckle, C. Kromberg 386,075
Buckle, harness, J. A. Hollenberger 386,070
Burglar alarm, R. H. Umbenhaur 386,045
Button, C. A. Peirce 385,876
Button attaching machine, E. H. Taylor 385,734
Button, collar, E. T. Dahlberg 386,002
Cable stop, slack, F. B. Graves 385,754
Cake or pie pan, M. Littleton 386,077
Can. See Refrigerating can.
Can machine, E. F. Verdel 386,096
Car brake, I. Nicholson 386,024
Car coupling, C. A. Bond 385,994
Car coupling, A. P. Brewster 385,789
Car coupling, C. W. Deboard 386,060
Car coupling, J. Helm 385,929
Car coupling, J. G. Hornbarger 386,012
Car coupling, F. L. McNab 385,868
Car coupling, J. Shultes 385,731
Car heater, E. Henn 385,932
Car spring, N. H. Davis 385,917
Car spring, T. C. Davis 385,918
Car starter, R. O. Gercke 385,800
Cars by electricity, device for lighting and heating, D. C. Roberts 385,774
Cars, driving mechanism for electric railway, E. E. Ries 386,086
Cars, electric motor for street, W. S. Salisbury 385,727
Cars, system and apparatus for heating and lighting, G. Smith 385,882
Carriage, self-propelling, J. F. Sinkler 385,881
Cartridge magazines, load indicator for, W. R. Miller 385,942
Casket, Gould & Baldwin 385,707
Casks and barrels, machine for making, A. Dunbar 385,850
Casting ingots, C. C. Currier 385,749
Cement, I. C. Hatch 385,859
Chair, W. H. Walker 385,890
Chimney top, A. Herendeen 386,010
Chuck and attachment for turning treenails, lathe, F. Cumming 385,793
Churn, J. C. Cole 385,696
Churn, J. Ingells 385,714
Churn, W. H. H. Spradlin 385,828
Churn dasher, J. Davis 385,698
Cistern, Miller & Hochstuhl 385,872
Cistern cleaner, F. E. McNall 385,869
Clamp. See Extension clamp.
Clamp, P. A. Whitney 385,983
Clasp. See Corset clasp.
Clay, treating, S. Friend 385,750
Cleaner. See Cistern cleaner. Comb cleaner.
Cloth, machine for unwinding, drawing off, and cutting, N. Harris 386,068
Cock, gas, T. Maguire 385,719
Coffee pot, W. Racer 385,880
Column, plate metal, Mesker & Edwards, 385,762 to 385,768
Comb cleaner and comb, combined, W. M. Dixon 385,796
Cooker, steam, J. W. Davis 385,794
Cooler. See Beer cooler.
Cork extractor, G. W. Engel 386,005
Corkscrew, W. N. Barrett 385,834
Corn from the cob, machine for cutting green, G. L. Merrill 385,871
Corset clasp, M. W. Henius 385,710
Cotton gin, P. V. Westfall 385,982
Counter stiffeners, mechanism for forming, P. Cox 385,745
Coupling. See Car coupling. Pipe coupling. Thill coupling.

© 1888 SCIENTIFIC AMERICAN, INC.

Crank arm, extensible, G. Kibbe 385,717
Crate, folding shipping, S. G. Travis 385,972
Cuff holder, S. B. Bacon 386,101
Cuff holder, adjustable, J. N. Clouse 386,001
Cut-off to prevent freezing in water pipes, H. K. Whitner 386,098
Cutter. See Band cutter. Nail cutter. Paper cutter.
Damper, automatic, Arnold & Staples 385,692
Damper, stove pipe, J. E. Fenner 385,923
Dental engine, W. A. Knowles 385,812
Dentistry, operative, C. H. Land 385,718
Disintegrator and strainer, W. P. Dodson 386,061
Display stand, traveling, N. B. Haynes 385,755
Door, J. N. Lilygren 386,018
Door check and spring, S. Pickering *et al* 385,958
Door hanger, G. F. Grannis 385,708
Door securer, A. J. Chase 385,906
Door, self-closing, M. Tillotson 386,042
Drawing board, D. D. Huyett 386,072
Drawing on marble, R. Durrin 386,062
Dredging machine, Knight & Lambing 385,759
Dress form, P. Quinn 385,725
Drilling and tapping machine, stay bolt hole, T. Reese, Jr 386,032
Dust collecting machine, J. B. Allfree 385,899
Dust collector, H. Seck 386,037
Electric battery, W. P. Kookogey 385,760
Electric battery, I. L. Roberts 386,090
Electric conductor, L. Daft 385,915
Electric lock, F. J. Gridley 386,066
Electric machine, magneto, W. Humans 386,071
Electric machines, commutator for dynamo, F. B. Mitchell 385,943
Electric switch, S. S. Wheeler 385,782
Electrical instruments, protector for, G. W. & W. Mingle 385,770
Electrical switch, J. E. Mayo 385,815
Elevator, A. C. Newton 385,722
End gate, E. Burklund 385,841
Engine. See Dental engine. Motor engine. Rotary engine.
Engines, speed and pressure regulator for blowing, F. McCarthy 385,941
Evaporating liquids, apparatus for, J. U. Lloyd 385,939
Exercising machine, S. M. Barnett 385,901
Extension clamp, P. S. Graves 386,065
Extractor. See Lemon juice extractor.
Fan for furniture, automatic, H. M. Bien 385,695
Feed trough, C. Hillingsworth 385,756
Feed water heater and purifier, J. Miller 385,769
Fence or guard, J. Norwood 386,083
Fence pickets, machine for sawing, S. D. Riegel 386,035
Fence stay, wire, L. W. Lindley 386,019
Fence, wire, B. Scarles 385,729
Fertilizer distributer, A. J. Baugh 385,990
File box, H. A. Curtis 386,058
File or other rack, revolving adjustable paper, C. H. Dexter 385,699
Filing papers, J. M. Junkin 385,758
Firearm, magazine, F. Passler 385,875
Fireproof composition, J. Blaszkaye 385,694
Fish hook, J. H. Hunter 385,913
Fishing reel, A. B. Hendryx 385,931
Flax, etc., apparatus for breaking, scutching, and cleaning, J. O. Wallace 385,737
Flour mills, grinding rolls for, H. A. Hueffner 386,014
Fluid meter, rotary, J. A. Tilden 385,970, 385,971
Fluids, apparatus for mixing aeriform, Morrin & Cosgrove 385,873
Flushing tank for closets, automatically operating, F. H. Paradice 385,823
Foot warming apparatus for beds, J. A. Lewis 385,865
Forgings, machine for making rolled, C. E. Gould 385,752
Frame. See Harvester frame.
Fruit packing press, E. A. Chatfield 385,907
Fruit press, G. L. Cudner 385,697
Furnace. See Gas furnace.
Furnace for heating wheel tires, J. B. Hannay 385,925
Furnance fuel feeder, Cochran & Lindsay (r) 10,942
Furnaces, evaporating pan for hot air, F. Kernan, Jr 385,716
Game apparatus, F. F. Gibford 386,007
Garment stays, apparatus for making, E. C. Bowling 385,996
Gas furnace, retort, D. D. Flemming 385,854
Gate, M. Nolan 385,771
Glass, apparatus for the manufacture of sheet, A. Thompson 385,735
Glove, ball catcher's, J. W. Sauer 385,728
Governor, steam engine, F. A. & T. Scheffler 386,036
Grain, hulling, cleaning, and separating, F. Melkersman 385,870
Graphophone, C. S. Tainter 385,866
Graphophonic tablet, C. S. Tainter 385,867
Grate for furnaces, etc., W. Phipps 385,957
Grater, F. Pollack 385,879
Grip, pneumatic, S. P. Baird 385,989
Hair dressing, M. V. Babcock 385,988
Hames, pipes, or rods, machine for bending, C. P. Spencer 385,778
Hammer, drop, F. M. Leavitt 386,076
Handle. See Saw handle. Velocipede handle.
Hanger. See Door hanger.
Harness shaft loop, C. C. Smith 386,093
Harrow, D. C. Markham 386,021
Harrow, L. J. Weintz 385,739
Harrow tooth, G. Sweet 386,094
Harvester frame, B. F. Stewart 386,733
Harvesting and husking machine, corn, J. A. Hilbert 385,861
Harvesting machine, A. Stark 385,779
Heater. See Car heater. Feed water heater.
Heel burnishing machine, W. C. Evans 385,702
Heel nailing machine, E. Merritt 385,748
Heel nailing, slug for, F. F. Raymond, 2d 385,960
Hemstitching, C. H. Owen 385,772
Hobby, horse, W. E. Crandall 385,792
Hoe, E. H. Sublett 386,040
Hoist, slaughter house, J. H. Tardy 385,969
Hoisting tackle, J. T. Hambay 385,856
Holder. See Cuff holder. Horse tail holder. Pencil and crayon holder. Rein holder. Sash holder. Twine holder.
Hook. See Fish hook.
Hoop. See Toy hoop.
Horse power, M. B. Patterson 386,026
Horse tail holder, O. H. Muntz 385,721
Hose bridge, C. J. P. Heim 386,008
Hose couplings, self-locking automatic device for opening and closing valves to air brake, Porter & Grosvenor 385,959
Hose nozzle, J. H. Johnson 385,757
Hot air regulator, A. T. Bemis 385,992
Houses, adjustable folding partition for, C. S. Langworthy 385,813
Hydrant, A. J. Tyler 386,095
Indicator. See Overflow indicator. Street or station indicator.
Induction coil, coin-operated, J. W. Hazell 385,927
Ingot moulds, feeder for, S. H. Boucher 385,836, 385,837
Ingots, plating, W. F. Whiting 385,963
Ironware, enameled, H. C. Milligan 386,023
Ironing table, S. H. West 385,892
Jack. See Lifting jack.
Japanning machine, I. G. Hooper 385,933
Kegs, bottles, etc., tap for, Schofield & Brierley 385,730
Knife sharpener, W. E. Ginn 385,706
Knob, A. T. Matthews 385,814
Ladder, flexible extension, D. Parks 385,874
Ladders to prevent accidents from slipping, etc., shoe for, W. B. Harison 385,806
Lamp, arc, J. E. Gaston 385,705
Lamp, gas, J. W. Baker 385,785
Lamp shade, G. Watson 386,046
Lamps, automatic cut-out for incandescent, Wightman & Lemp 386,099
Lamps, extinguisher mechanism for, W. Snelgrove 386,038
Lantern, railway signal, C. H. Peters 385,877
Lawn rake, L. Gibbs 385,751
Leather, ornamenting, P. Hannig 385,926
Leggin, W. H. Wiley 386,047
Lemon juice extractor, J. L. Easley 385,851
Life-saving buoy boat, J. Sample 385,961
Lifting jack, A. A. Strom 385,885
Lock. See Bedstead slat lock. Electric lock. Nut lock. Sash lock.
Locomotive boiler, G. S. Strong 385,968
Looms expanding pulley of shuttle box motions for, H. Wyman 385,896
Marble, composition for artificial, L. Van den Steen 386,039
Measuring machine, cloth, C. H. Young 386,050
Mechanical movement, W. A. Pitt 386,027
Metal turning and polishing tool, E. A. Howe 386,013
Metals from rust, manufacture of paste for polishing and protecting, Rosenfeld & Zeleny 385,776
Meter. See Fluid meter.
Mould for hollow articles, W. Hainsworth 386,067
Motor engine operated by the combustion of liquid hydrocarbon, W. D. & S. Priestman 386,029
Mower, Hoke & Harris 385,862
Mower, F. N. Violet 385,979
Mowers, journal bearing for lawn, C. Newhall 386,082
Mowing machine, F. M. Hunt 386,015
Multiple switch board, M. G. Kellogg 385,863
Multiple switch board, A. Sechrist 385,826
Nail cutter, T. F. Curley 385,914
Napkin ring, E. C. Bowling 385,995
Nut lock, W. H. Van Wart 385,889
Nut lock for valves, W. H. Van Wart 385,888
Oven, portable, A. Day 385,919
Overflow indicator, M. L. Russell 385,825
Packing for condenser tubes, W. E. Volz 386,048
Packing, metallic, P. F. Holmgren 386,011
Padlock, M. W. Fralm 385,799
Pan. See Cake or pie pan.
Paper cutter, W. H. Golding 385,803
Patterns for garments, apparatus for marking out, F. C. Noar 385,944
Pencil or crayon holder, lead, O. A. Weissenborn 385,781
Photographic emulsion, manufacturing supports for, F. H. Froedman 386,006
Photographic film, E. E. Ellis 385,797
Piano action, J. McDonald 386,079
Pianoforte, J. McDonald 386,080
Pickets and balusters, pattern for, S. D. Riegel 386,034
Pin. See Safety pin.
Pipe coupling, F. M. Wilder 385,740
Planing and drilling machine, automatic wood, C. E. Bickford 385,835
Planing machine, Woods & Thomas 385,895
Planter combined, corn and cotton, J. C. Mallison 385,940
Planter, corn, J. M. Johnston 386,016
Planter, corn, H. S. McMillion 385,817
Planter, sulky lister plow corn, L. E. Waterman 385,738
Plotting contours of ground, instrument for, M. Stixrud 385,780
Plow attachment, M. Pate 385,773
Pool and billiard table, combination, R. L. Rink 386,089
Pot. See Coffee pot.
Power. See Horse power.
Press. See Baling press. Fruit press. Fruit packing press.
Printing machine, lithographic, J. T. Hawkins 385,860
Propelling and steering apparatus for ships, etc., J. I. Thornycroft 386,041
Pulley, split, Hicks & Brooksbank 385,712
Pump, G. H. Caughrean 385,842
Pump, beer, R. Wellens 385,981
Pump, chain, C. A. Bartliff 385,786
Pump, compound air compressing, E. C. Fasoldt 385,853
Pump, rotary, W. B. Allyn 385,832
Punch, hand, W. Yates 385,897
Punching machine, check, J. N. Williams 385,741
Radiation, apparatus employed in systems of indirect, A. Rasner 386,031
Rails, straightening slot, A. J. Moxham 385,818
Railway and wire conduit, combined electric, E. E. Ries 386,087
Railway crossing, E. R. E. Cowell 386,056
Railway, electric, E. M. Bentley 385,902
Railway, electric, E. W. Heald 385,928
Railway, electric, E. E. Ries 386,085
Railway rail, F. Euphrat 385,701
Railway rails, building blocks, paving blocks, etc., material for, H. F. Ferris 386,064
Railway signal, C. F. De Redon 385,920
Railway signal, E. A. Sharp 385,963
Railway signal, G. H. Wright 386,049
Railway station signal, C. J. Woodward 385,742
Railway system, electric, E. M. Bentley 385,787
Railway time signal, C. Barry 386,052
Railways, electric signal for, E. A. Sharp 385,964
Railways, grip gear for cable street, J. Helm 385,930
Railways, gripping mechanism for cable, J. Walsh, Jr 385,980
Railways, switch on overhead lines in electric, E. M. Bentley 385,903
Rake. See Lawn rake.
Ratchet clutch mechanism, reversible, W. B. Turner 386,044
Reel. See Fishing reel.
Refrigerating can, V. W. Blanchard 385,993
Regulator. See Hot air regulator.
Rein holder, C. Wendrich 385,891
Ring. See Napkin ring. Tool post ring.
Rolling wire nails, machine for, A. G. Wilkins 385,784
Rotary engine, Gregersen & Gramnas 385,805
Safety pin, Clark & Ingraham 386,000
Sash holder, R. C. Boekler 385,904
Sash lock, J. Jackson 385,935
Saw, fire wood drag, G. H. Branson 385,997
Saw handle, G. N. Clemson 385,844
Saw sharpening machine, A. Blackmer 385,693
Sawing machine, W. E. Patterson 385,824
Scarf, neck, L. Eschner 385,922
School seat and desk, combined, A. Landon 385,864
Screw blanks, machine for making, C. D. Rogers 386,091
Screw, wood, C. D. Rogers 386,092
Seat. See School seat. Shifting seat.
Seeding machine, A. N. Norris 385,724
Sewing machine, E. H. Triesler 385,973
Sewing machine thread unwinder, A. J. Hart 385,858
Sheet metal articles, cushioned die for swaging, F. C. Cannon 385,905
Shifting seat, C. C. Adelsperger 385,831
Shoe fastening, G. H. Coursen 385,846
Shovel blank, J. J. Johnston 385,810
Shovel blanks, maching for cutting, H. M. Myers 385,820
Shovel blanks, machine for cutting and splitting, J. J. Johnston 385,811
Shovel blanks, making, J. J. Johnston 385,808
Shovel blanks, making, H. M. Myers 385,819, 385,821
Shovels, etc., making blanks for, J. J. Johnston 385,809
Shutter bower, H. W. Steiner 385,732
Sign, W. H. Coote 385,912
Signal. See Railway signal. Railway station signal. Railway time signal. Switch signal. Train order signal.
Signal lines, compensator for, A. A. Strom 385,884
Sluice box, J. H. Rae 386,030
Snow excavator, rotary, S. H. Dunning 385,700
Soldering machines, can delivery device for, J. W. Roberts 385,775
Speaking tube, carriage, G. A. Beach 386,053, 386,054
Spectacles, repair clamp for, N. J. Eddy 386,004
Spring. See Car spring.
Square and bevel, try, C. W. Reeves 386,033
Square, rule, calipers, and dividers, combined, F. E. Nutting 385,822
Stand. See Display stand.
Steering apparatus, J. H. Konitzky 385,936
Stool, store counter, G. Scott 385,062
Stove, P. D. Beckwith 385,991
Stove, H. Lindas 385,988
Street or station indicator, M. Anthony 385,985
Strength testing machine, coin-controlled, J. Devantery 385,921
Surgeon's silk or catgut, package of, J. E. Lee 385,937
Suspenders, F. L. Akerley 385,898
Switch. See Electric switch. Electrical switch.
Switch boards, wiring, J. A. & F. B. Cook 385,846
Switch operating mechanism, A. K. Mansfield 386,020
Switch signal, E. R. E. Cowell 386,057
Syringe, vaginal, J. M. Combs 385,911
Table. See Ironing table. Pool and billiard table. Turntable.
Tack strips, machine for heading, J. E. Crisp 385,747
Tack strips, machine for heading, Grandy & Copeland 385,753
Tag fastener, C. W. Sheppard 385,965
Tank. See Flushing tank. Water closet tank.
Telegraphic recording apparatus, C. Cuttriss 386,059
Telephone central station apparatus, Vail & Seely 385,974, 385,976, 385,977
Telephone, electric, N. Parks 385,956
Telephone exchange signaling, Vail & Seely 385,978
Telephone, mechanical, S. D. Brear 385,839
Telephone sub-station apparatus, Vail & Seely 385,975
Thill coupling, M. F. McIntyre 385,867
Thread unwinder, T. Handley 385,857
Threshold or door sill, Pratt & Walker 386,084
Tilling ground, apparatus for, E. R. Whitney 385,984
Tobacco box, C. A. Reynolds 385,726
Tool, combination pocket, W. R. Buzzell 386,055
Tool post ring, W. S. Cobb 385,845
Topographical measurements, machine for taking and recording, J. W. Snapp 385,827
Torpedo machines, tray for, J. J. Detwiller 385,795
Toy hoop, H. D. Gardy 385,704
Toy riding stick, S. E. Clark 385,910
Train order signal, A. A. Strom 385,883
Trap. See Animal trap.
Trough. See Feed trough.
Tube. See Speaking tube.
Tug, French & Maltby 385,855
Turntable for tramways or street railways, Huston & Martin 385,807
Tuyere for forges, H. T. Nielsen 385,723
Twine holder, automatic, D. A. Morrison 386,081
Type writing machine, G. W. N. Yost 386,100
Umbrella, cane, J. McCormick 386,078
Valve, automatic, Timlin & Heidinger 386,043
Valve, engine, G. S. Strong 385,967
Valve, hydraulic, M. B. Kirker (r) 10,943
Valve, steam engine, F. D. Child 385,843
Vehicle running gear, Chafey & Willcox 385,744
Vehicle, two-wheeled, Morlock & Haegelin 385,726
Velocipede, J. S. Copeland 385,847
Velocipede handle, T. B. Jeffery 385,715
Washers, leather coil for, G. H. Avery 386,051
Watch, mainspring, D. H. Church 385,908
Water closet tank, A. Haarlander 385,709
Water purifying apparatus, O. H. Jewell 386,073
Weather strip, T. Hibbert 385,711
Weighing and recording apparatus, automatic, E. H. Amet 385,900
Welding by electricity, E. E. Ries 386,088
Wheels or other bodies, machine for determining and adjusting the balance of, R. Bagaley 385,833
Window, B. F. Dettra 386,003
Wire, machine for screw-threading, L. Goddu 385,801
Wire tension device, W. M. Augustine 385,987
Wire tightener, E. A. Chase 385,998
Wood to be afterward bent, apparatus for steaming, R. T. Pettebone 385,878
Wool scouring and washing machinery, J. & W. McNaught, Jr 385,761

DESIGNS.

Badge, J. Steiner 18,456
Button, R. Liebmann 18,450
Clutches, frame or support for friction, H. W. Hill 18,443
Cornice, F. Koskul 18,448
Glove, etc., J. Kayser 18,444
Knife and fork, M. Richmond 18,455
Panel, open work, F. Mankey 18,451, 18,452
Radiator ornamentation, J. B. Dyar 18,440
Scarf, H. Rawak 18,454
Spoon, H. A. Pistorius 18,453
Stove, cooking, Keep & Wipfler 18,445
Type ornaments, font of combination, C. E. Heyer 18,442
Walls, surface ornamentation of, F. Koskul, 18,446, 18,447, 18,449
Water closet bowl and standard, W. R. Emerson 18,441

TRADE MARKS.

Bicycles and tricycles, St. George's Engineering Co 15,577
Coffee, roasted, Hayworth & Dewhurst 15,669
Compounds for cleansing, washing, and scouring, Keystone Chemical Company 15,672
Engravers' plates, dies, and tools, J. Sellers & Sons 15,675
Flour, E. N. Gardner 15,667
Knives, razors, shears, and scissors, J. Sellers & Sons 15,676
Linen and hemp goods of all descriptions, R. T. Webb 15,678
Liqueurs or cordials, Rocher Freres 15,673
Medicinal herbs, certain preparations of, G. W. Wright 15,680
Medicinal tinctures and fluid extracts, Weeks & Potter 15,679
Ointment, veterinary, S. Heiser 15,670
Packing constructed wholly of flax fiber with a red cord center, W. T. Y. Schenck 15,674
Pomades for toilet use, J. E. Brearey 15,666
Remedy for dyspepsia, G. Grader & Co 15,668
Washing powder, Hodgson & Co 15,671

A Printed copy of the specification and drawing of any patent in the foregoing list will be furnished from this office for 25 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway, New York.

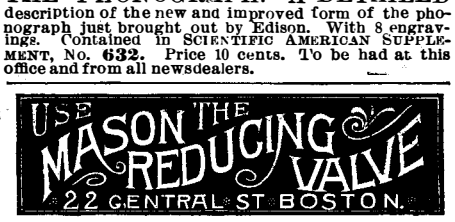
Canadian Patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of $40 each. If complicated, the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

SEBASTIAN, MAY & CO'S
Improved Screw Cutting
Foot & Power **LATHES**
$60
Drill Presses, Chucks, Drills, Dogs, and machinists' and amateurs' outfits. *Lathes on trial.* Catalogues mailed on application.
165 W. 2d St., Cincinnati, O.



ARTESIAN
Wells, Oil and Gas Wells, drilled by contract to any depth, from 5 to 3000 feet. We also manufacture and furnish everything required to drill and complete same. Portable Horse Power and Mounted Steam Drilling Machines for 100 to 600 ft. Send 6 cents for illustrated catalogue.
Pierce Well Excavator Co.
New York.

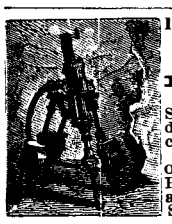
INFLUENCE MACHINES.—A PAPER by James Wimshurst, giving a complete account of the recent forms of generators of static electricity. With 13 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **647.** Price 10 cents. To be had at this office and from all newsdealers.

MACHINISTS' SUPPLIES SEND 13 CENTS FOR ILLUSTRATED CATALOGUE MONTGOMERY & CO 105 FULTON ST. N.Y. LATHES CHUCKS DRILLS TOOLS SCREWS CALLIPERS ETC

THE PHONOGRAPH.—A DETAILED description of the new and improved form of the phonograph just brought out by Edison. With 8 engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **632.** Price 10 cents. To be had at this office and from all newsdealers.

USE MASON THE REDUCING VALVE
22 CENTRAL ST BOSTON.

TELESCOPES—THEIR HISTORY and the discoveries made with them.—By Prof. E. S. Holden. An interesting historical paper, discussing the development of the telescope from the time of Galileo up to the present day. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **629.** Price 10 cents. To be had at this office and from all newsdealers.



INGERSOLL ROCK DRILL CO.,
10 PARK PLACE, NEW YORK.
Improved "Eclipse"
ROCK DRILLS,
For Mining, Tunneling, Shaft-Sinking, Quarrying, Submarine drilling, and for all kinds of rock excavation.
"Straight Line" AIR COMPRESSORS, Boilers, Steam and Horse Power Hoists, Electric Blasting Batteries and General Mining Machinery
Send for full descriptive Catalogue

HOME-MADE INCUBATOR.—PRACTICAL directions for the manufacture of an effective incubator that has been carefully tested and found to perform all that may be reasonably expected; with directions for operating. With 4 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **630.** Price 10 cents. To be had at this office and from all newsdealers.

ROCK DRILLS
AIR COMPRESSORS &
GENERAL MACHINERY FOR
MINING, TUNNELING,
QUARRY & RAILROAD WORK.
RAND DRILL Co 23 PARK PLACE NEW YORK

FIRE-BRICK.—BY R. A. COOK, A.M. An interesting description of the mining of fire clay and the manufacture of fire brick at Mt. Savage, Maryland where is located one of the largest establishments in the country devoted to this industry. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **538.** Price 10 cents. To be had at this office and from all newsdealers.

PRINT Your Own CARDS PRESS $3. Circular size $8. Newspaper size $44. Type setting easy, printed directions. Send 2 stamps for catalogue presses, type, cards, &c., to factory, KELSEY & CO. Meriden, Conn.

THE AGE OF THE STARS.—BY Prof. Janssen. History of the discoveries that have led to the introduction of the doctrine of evolution in the science of astronomy. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **630** and **631.** Price 10 cents each. To be had at this office and from all newsdealers.

CATALOGUES FREE TO ANY ADDRESS
GEARS AND PARTS OF **MODELS**
GOODNOW & WIGHTMAN BOSTON

ELECTRIC LIGHT AND POWER.
Edco system of Arc and Incandescent Lighting. Direct or in connection with the Storage Batteries of the Electrical Accumulator Co. Dynamos, Motors, Lamps, Batteries, and General Electrical Supplies.
THE ELECTRO DYNAMIC COMPANY,
224 Carter Street, Philadelphia, Pa.

© 1888 SCIENTIFIC AMERICAN, INC.

HENRY CAREY BAIRD & CO.
Industrial Publishers, Booksellers, and Importers,
810 Walnut St., Philadelphia, Pa., U. S. A.

☞Our new and Revised Catalogue of Practical and Scientific Books, 80 pages, 8vo, and our other Catalogues and Circulars, the whole covering every branch of Science applied to the Arts, sent free and free of postage to any one in any part of the world who will furnish his address.

Queensland Post and Telegraph Department—Meteorological Branch.—The New "Weather Chart of Australasia at 9 A. M.," published daily except Sundays and holidays, by the Chief Bureau at Brisbane (established by the Queensland government, January 1, 1887), will be sent post free to any part of the world for an annual subscription of £2. 2s., payable in advance. This large Chart contains graphic delineations of the data hereinafter mentioned, derived by wire from seventy-two selected observatories distributed over Western Australia, Northern Territory, Central Australia, South Australia, North Queensland, South Queensland, New South Wales, Victoria, Tasmania, and New Zealand, besides collated information from about three hundred smaller stations. Additions to the number of reporting stations are made from time to time as the telegraph lines extend, and as new observatories are founded in the vast regions of the interior. The following data and elements are lithographed in black and red on the Chart: In red—barometric readings and isobaric lines, shade temperatures, areas of clear sky, and amounts of cloud. In black—direction and force of wind, percentage of humidity, rain falling and symbols for other hydrometeors, state of sea: also extreme shade temperatures, hydrometeors, and rainfall during last 24 hours, together with any necessary remarks, including wet bulb temperatures when the percentages of humidity are below 12 (a value not unfrequently occurring at Alice Springs, Boulia, and other places near the centre of the Australian Continent). It is hoped that scientists generally will appreciate the efforts of Queensland to place before the world these complete statistics of the various climates of Australasia—a task never before attempted. Specimens may be seen at the office of the Agent-General for Queensland, 1 Westminster Chambers, Victoria Street, and at Mr. Stanford's, 55 Charing Cross, London, S.W. Apply to CLEMENT L. WRAGGE, Government Meteorologist, Brisbane.

ARCHITECTURAL BOOKS.

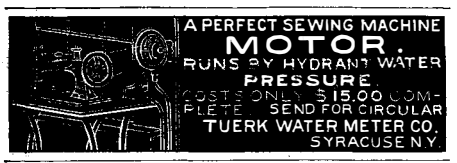
Useful, Beautiful, and Cheap.

To any person about to erect a dwelling house or stable, either in the country or city, or any builder wishing to examine the latest and best plans for a church, school house, club house, or any other public building of high or low cost, should procure a complete set of the ARCHITECTS' AND BUILDERS' EDITION of the SCIENTIFIC AMERICAN.

The information these volumes contain renders the work almost indispensable to the architect and builder, and to persons about to build for themselves they will find the work suggestive and most useful. They contain colored plates of the elevation, plan, and detail drawings of almost every class of building, with specification and approximate cost.

Four bound volumes are now ready and may be obtained, by mail, direct from the publishers or from any newsdealer. Price, $2.00 a volume. Stitched in paper covers. Subscription price, per annum, $2.50. Address and remit to

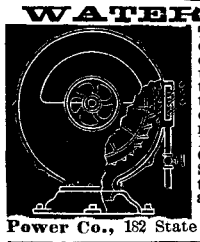
MUNN & CO., Publishers,
361 Broadway, New York.


A PERFECT SEWING MACHINE MOTOR.
RUNS BY HYDRANT WATER PRESSURE.
COSTS ONLY $15.00 COMPLETE. SEND FOR CIRCULAR
TUERK WATER METER CO.
SYRACUSE N.Y.

HOW TO MAKE THE WIMSHURST Influence Machine.—Directions for making a cheap and simple but efficient machine. With one figure. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **646**. Price 10 cents. To be had at this office and from all newsdealers.

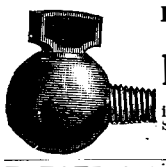
WATCHMAKERS
Send for REDUCED PRICE LIST of Whitcomb Lathes, date of July 1, 1888. American Watch Tool Co., Waltham, Mass.

WATER MOTORS.



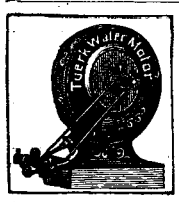
The most efficient and economical means of obtaining from one-eighth to fifteen horse power and upward. A motor which does the greatest amount of work with the use of the smallest stream of water, specially adapted for running cheaply and efficiently, Printing Presses, Elevators, Church Organs, Coffee Mills, Sewing Machines, Lathes, Dental Contrivances, and in fact, any piece of Mechanism.
Binghamton Hydraulic Power Co., 182 State Street, **Binghamton, N. Y.**

GOLD MINING MACHINERY. — DESCRIPTION of some new mining plants constructed in England for use in the Transvaal, Austria and Hungary. With 10 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **593**. Price 10 cents. To be had at this office and from all newsdealers.



EVERY USER OF MACHINERY SHOULD LEARN
How to Use Loose Pulleys.
Useful information on this subject is given in our "Catalogue No. 55." Sent free to any address.
VAN DUZEN & TIFT, Cincinnati, O.

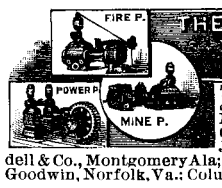
ELECTRIC CONVEYORS.—DESCRIPTION of two ingenious systems for the electric carriage of small packages. Illustrated with 13 engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **464**. Price 10 cents. To be had at this office and from all newsdealers.



Hydraulic Elevators
—AND—
WATER MOTORS.
Send for New Catalogue,
Tuerk Hydraulic Power Co.
12 Cortlandt St., New York,
39 Dearborn St., Chicago.

PERFECT NEWSPAPER FILE
The Koch Patent File, for preserving newspapers, Magazines, and pamphlets, has been recently improved and price reduced. Subscribers to the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT can be supplied for the low price of $1.50 by mail, or $1.25 at the office of this paper. Heavy board sides; inscription "SCIENTIFIC AMERICAN," in gilt. Necessary for every one who wishes to preserve the paper. Address
MUNN & CO., Publishers SCIENTIFIC AMERICAN.

CURE for the DEAF by PECK'S PAT. IMPROVED CUSHIONED EAR DRUMS. Whispers heard distinctly. Comfortable, invisible. Illustrated book & proofs, FREE. Address or call on F. HISCOX, 853 Broadway, N. Y. Name this paper.



THE VOLKER & FELTHOUSEN MFG. CO.
MANUFACTURERS OF
BUFFALO DUPLEX STEAM PUMPS
BUFFALO, N.Y.

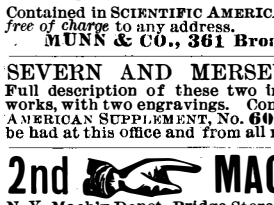
For Sale at Factory Prices by A. Aller, N. Y.; Walworth Construction & Supply Co., Boston; Henry I. Snell, Phila.; Thos. J. Bell & Co., Cincinnati; Shaw, Kendall & Co., Toledo; The George Worthington Co., Cleveland; Goulds & Austin, Chicago; Kennedy & Pierce Machinery Co., Denver, Col.; Sheriff & Ashworth, Pittsburgh, Pa.; Jos. Baur, Manistee, Mich.; Jas. Jenks & Co., Detroit; Wickes Bros., East Saginaw; Adolf Leitelt, Grand Rapids; E. F. Osborne & Co., St. Paul, Minn.; Rundle, Spence & Co., Milwaukee; Joshua Hendy, Machine Works, San Francisco; Flynn & Emrich, Baltimore; Forbes, Liddell & Co., Montgomery Ala; Bailey & Leb by, Charleston, S.C.; Pond Engineering Co., St. Louis and Kansas City; O.B. Goodwin, Norfolk, Va.; Columbus Supply Co. Columbus, O.; C.S. Leeds & Co. Minneapolis; H.D. Coleman, New Orleans.

ICE-HOUSE AND COLD ROOM.—BY R. G. Hatfield. With directions for construction. Four engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, **59**. Price 10 cents. To be had at this office and of all newsdealers.

OIL WELL SUPPLY CO. Ltd.
91 & 92 WATER STREET,
Pittsburgh, Pa.,
Manufacturers of everything needed for
ARTESIAN WELLS
for either Gas, Oil, Water, or Mineral Tests, Boilers, Engines, Pipe, Cordage, Drilling Tools, etc. Illustrated catalogue, price lists and discount sheets on request.

HYPNOTISM IN FRANCE.—AN INTERESTING REVIEW of the present status of this subject, by Max Dessoir. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **613**. Price 10 cents. To be had at this office and from all newsdealers.

Improved Bench Centering Chuck.



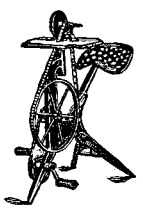
Will perfectly center round, square, and octagon pieces from ¼ in. to 1½ in. One of the most useful, durable, and labor saving tools ever made for centering purposes, and is being universally used. Price $12. Manufactured by THE CUSHMAN CHUCK CO., Hartford, Conn.

SYSTEMS OF DISTRIBUTION OF Electricity.—A lecture by Elihu Thomson, delivered in the Sibley College course. The series, multiple arc, series multiple and multiple series, accumulator and induction systems described, and their advantages and disadvantages discussed. With 18 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **603**. Price 10 cents. To be had at this office, and from all newsdealers.

RENSSELAER POLYTECHNIC INSTITUTE, Troy, N. Y. *The oldest School of Engineering in the United States.* Next term begins Sept. 12. The Register for 1888 contains list of graduates for 62 years, with their positions; also course of study, requirements for admission, expenses, etc. Candidates living at a distance may be examined at their homes.
Address DAVID M. GREENE, Director.

ERIE ENGINE WORKS, WALNUT STREET ERIE PA MANUFACTURERS OF STATIONARY-PORTABLE-AGRICULTURAL-ENGINES STATIONARY-PORTABLE-VERTICAL-BOILERS

WOOL HAT MAKING.—FULL DESCRIPTION of the process.—Wool washing, carding and forming, settling, pumping and washing out, stretching or stumping, drying, storing and steaming, pulling out, dyeing, blocking, storing, pressing, finishing, rounding, curling and ironing, paring, trimming and shaping, velouring off, With 20 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **626, 628**, and **629**. Price 10 cents each. To be had at this office and from all newsdealers.



BARNES' NEW
Patent Velocipede Grinding and Polishing Machine.
For grinding and polishing Cutlery, Jewelry, Ornamental Wares, Skate Grinding, etc., etc., as an accessory to or for a distinct business, a large profit with small outlay. Outfits of Foot Power Machinery for practical shop service in Wood and Metal. Catalogue free.
W. F. & John Barnes Co.,
1999 Ruby St., Rockford, Ill.

THE DEVELOPMENT OF THE MERcurial Air Pump.—By Prof. Silvanus P. Thompson, D.Sc. An interesting historical paper in which the various mercurial air pumps in use from early times up to the present are classified and described. I. Upward driving pumps. II. Downward driving pumps. III. Upward and downward driving pumps. IV. Combination pumps. V. Injector pumps. VI. Mechanical mercurial pumps. With 36 engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **629, 630** and **631**. Price 10 cents each. To be had at this office and from all newsdealers.

GUILD & GARRISON
BROOKLYN, N. Y., U. S. A.
Builders of **Steam Pumps** for Water and every description of Liquids or Semi-liquids. **Vacuum Pumps** of the highest efficiency. **Filter Press Pumps, Air, Gas, and Acid Blowers. Air Compressors, Boiler Feed Pumps, etc.**

ELECTRIC WELDING.—A PAPER BY Prof. Elihu Thomson, giving an account of a new way of utilizing the heating effects of heavy electrical currents for causing union between pieces of metal, whether of the same or of different kinds. With 4 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **592**. Price 10 cents. To be had at this office and from all newsdealers.

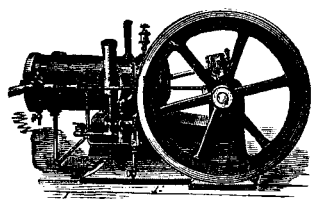
ART PHOTO-ENGRAVING CO. 53 FRANKLIN ST. N.Y. NEWSPAPER SKETCHES, MACHINE & CATALOGUE WORK

LIGHTNING CONDUCTORS.—DESCRIPtion of a new form of apparatus for testing lightning conductors, and the method of using it. Illustrated with 8 engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **596**. Price 10 cents. To be had at this office and from all newsdealers.

THE PENNA. DIAMOND DRILL & MFG. CO. **BIRDSBORO, PA.,** Builders of High Class Steam Engines. Diamond Drilling and General Machinery. Flour Mill Rolls Ground and Grooved.

COMPARATIVE VALUE OF STEAM and hot water for transmitting heat and power.—An elaborate discussion of the subject, by Charles E. Emory. Contained in SCIENTIFIC AMERICAN SUPPLEMENT No. **615**. Price ten cents. To be had at this office and from all newsdealers.

GAS ENGINES.



Best in principle, workmanship, and materials.
An unequaled small Motor adapted to all uses.
When the motor is not at work, the expense of running it ceases.
Simple, Safe, Economical, Durable. No extra insurance.
Four sizes: 1 H. P., ½ H. P., 1 man power, and Dental Engine.
These Engines are especially suited for Gasoline Gas for country use.
☞ *Send for Illustrated Catalogue.*
ECONOMIC GAS ENGINE COMPANY,
Office and Salesrooms - - 34 DEY ST. N. Y.

Campaign Badge Free with $1 order, either party. Nickel Plated, Self-Inking Pen and Pencil Stamp.

Your name on in Rubber, only **20 Cts.** silver. ☞Club of 6 different names for **$1.** bill. Closes to carry in Pocket. Strongest made.
RUBBER STAMP CO., New Haven, Conn.

AMMONIA SULPHATE.—A PAPER by Watson Smith, F.C.S., describing Gruneberg's apparatus and process for making sulphate of ammonia. With 3 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **566**. Price 10 cents. To be had at this office and from all newsdealers.

WELL Encyclopedia of 700 Engravings of WELL TOOLS, Diamond Drills and Lightning Hydraulic WELL Machines. Book free, 25c. for mailing it. **WELL** American Well Works, Aurora, Ill.

NATURAL GAS INDUSTRY AT PITTSburg, Pa.—A brief history of the Chartiers Valley Gas Company. With 5 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **627**. Price 10 cents. To be had at this office and from all newsdealers.

A NEW CATALOGUE OF VALUABLE PAPERS
Contained in SCIENTIFIC AMERICAN SUPPLEMENT, sent *free of charge* to any address.
MUNN & CO., 361 Broadway, New York.

SEVERN AND MERSEY TUNNELS.—Full description of these two important engineering works, with two engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **604**. Price 10 cents. To be had at this office and from all newsdealers.

2nd MACHINERY Lists Sent.
N. Y. Mach'y Depot, Bridge Store 16, Frankfort St., N.Y.

GEOLOGY EXPLAINED IN ITS SIMplest Form.—An interesting object lesson in geology. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **630**. Price 10 cents. To be had at this office and from all newsdealers.

$10.00 to $50.00 per night. A light and profitable business. **Magic Lanterns and Views** of popular subjects. Catalogues on application. Part 1 Optical. 2 Mathematical, 3 Meteorological, 4 Magic Lanterns, etc.
L. MANASSE, 88 Madison Street, Chicago, Ill.

QUARANTINE SYSTEM OF LOUISIana.—By Joseph Holt, M.D. Description of the methods of disinfection practiced. With 4 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **627**. Price 10 cents. To be had at this office and from all newsdealers.

RAILS FOR STREET RAILROADS.—A paper by A. W. Wright, C.E., discussing the comparative value of iron and steel as materials for street railroad rails. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **499**. Price 10 cents. To be had at this office and from all newsdealers.

PENSIONS $80,000,000 for Soldiers, Sailors, their widows or parents. PENSIONS INCREASED. Discharges procured. ☞No pension, NO FEE. Latest law, pamphlet Free! PATRICK O'FARRELL, Att'y, Washington, D. C.

DISEASES OF DYNAMOS.—A PAPER by S. P. Thompson, D. Sc., discussing the maladies to which dynamo machines are liable, and their treatment, cure and prevention. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **627**. Price 10 cents. To be had at this office and from all newsdealers.

BARREL MACHINERY.
E. & B. HOLMES,
BUFFALO, N.Y.

HUDSON RIVER BRIDGE AT Poughkeepsie.—A lecture by T. C. Clarke, C. E., in the Sibley College Course. General description, Foundations, Superstructure, Temporary Staging, Trestle Work With 3 engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **646**. Price 10 cents. To be had at this office and from all newsdealers.

Put an Electric Bell in your house or shop.
You can do it yourself with our Complete Outfit. Price $2 50
Outfit consists of 1 Electric Bell, 1 Battery, 1 Push Button, 100 feet Wire, and Staples for Wire.
C. E. JONES & BRO.,
55 & 57 Longworth, **CINCINNATI, O.**
It is important to us that you mention this paper.

NAVAL ARCHITECTURE.—AN INteresting review, by Mr. R. Duncan, of the progress that has been made in this branch of science during the last fifty years. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **589**. Price 10 cents. To be had at this office and from all newsdealers.

USEFUL BOOKS.

Manufacturers, Agriculturists, Chemists, Engineers, Mechanics, Builders, men of leisure, and professional men, of all classes, need good books in the line of their respective callings. Our post office department permits the transmission of books through the mails at very small cost. A comprehensive catalogue of useful books by different authors, on more than fifty different subjects, has recently been published for free circulation at the office of this paper. Subjects classified with names of author. Persons desiring a copy, have only to ask for it, and it will be mailed to them. Address,
MUNN & CO., 361 Broadway, New York.

PULLEYS, HANGERS, FRICTION CLUTCHES. PROGRESS MACHINE WORKS, A. & F. BROWN, **44 Park Place, N. Y.**

ICE & REFRIGERATING Machines. York Patent. **YORK MFG. CO., York, Pa.**

Proposals for Materials and Articles Required for use in the Construction of the U. S. Armored Cruiser "Maine."—NAVY DEPARTMENT, WASHINGTON, *July* 10, 1888.—Sealed proposals will be received at this Department until 12 o'clock noon, on Friday, the 10th day of August, 1888, for furnishing the materials required, under the Bureau of Construction and Repair, for use in the construction of said cruiser, at the Navy Yard, Brooklyn, N. Y. Printed schedules of the materials and articles required, arranged in classes and particularly described, blank forms on which proposals must be made, and all other information essential to bidders, can be obtained by regular dealers in, or manufacturers of, the articles required, on application to the Commandant of said Navy Yard. Proposals may be made for one or more of the classes as designated in the schedule, but no bid for a portion of any class will be considered. Proposals must be made in duplicate and enclosed in envelopes marked "Proposals for Materials for the 'Maine,'" and addressed to the Secretary of the Navy, Navy Department, Washington, D. C. The Secretary of the Navy reserves the right to reject any or all bids, as, in his judgment, the interests of the service may require.
D. B. HARMONY, *Acting Secretary of the Navy.*

TAKE THE Chicago and Indianapolis, Cincinnati, winter cities the **MONON ROUTE** BETWEEN Louisville, Indianapolis, Cincinnati, and all of Florida and South.
E. O. McCormick, Gen. Pass. Agent, Chicago.

ASSIGNEE'S SALE.
Smith, Beggs & Ranken Machine Co. Property.

Embracing nearly an **Entire Block of City Real Estate,** described as follows: The **whole Main Street front of City Block No. 296,** being 240 feet on west side of said street, with a frontage of **160 feet on east side of Second Street, 300 feet on south side of Monroe Street** (entire block front), by **150 feet on north side of Clinton Street,** being Lots Nos. 34, 35, 36, 62, and 63 of said block. Also all the improvements, machinery, fixtures, tools, and patterns on the above described premises. This property (being one of the largest and most complete establishments of the kind in the Western Country) will be sold by the undersigned, by order of the Court, at auction, on the premises, to the highest bidder, for cash, subject to a mortgage of about $60,000, on Tuesday, the 21st day of August, 1888, between the hours of 12 o'clock noon and 2 o'clock P. M. of said day. WM. H. THOMSON, *Assignee,*
At Boatmen's Saving Bank.
ST. LOUIS, MO., July 9, 1888.

FOR SALE—U. S. and English Patents on Metallic Knockdown Box. Superior to wooden boxes. U. S. Pat. No. 371,322, Eng. Pat. No. 16,724. Correspondence solicited with manufacturers. Address JOHN HOTHAM, Hillside, Westmoreland Co., Pa.

FOR SALE—Canadian and English patents on hand or power washing machine. W. T. Venable, Christiansburgh, Ky.

DUPLEX GAS REGULATOR CO. City, county, and state rights for sale. On exhibition at **105 West 41st Street, New York.**

FOREIGN PATENTS
THEIR COST REDUCED.

The expenses attending the procuring of patents in most foreign countries having been considerably reduced the obstacle of cost is no longer in the way of a large proportion of our inventors patenting their inventions abroad

CANADA.—The cost of a patent in Canada is even less than the cost of a United States patent, and the former includes the Provinces of Ontario, Quebec, New Brunswick, Nova Scotia, British Columbia, and Manitoba.

The number of our patentees who avail themselves of the cheap and easy method now offered for obtaining patents in Canada is very large, and is steadily increasing.

ENGLAND.—The new English law, which went into force on Jan. 1st, 1885, enables parties to secure patents in Great Britain on very moderate terms. A British patent includes England, Scotland, Wales, Ireland and the Channel Islands. Great Britain is the acknowledged financial and commercial center of the world, and her goods are sent to every quarter of the globe. A good invention is likely to realize as much for the patentee in England as his United States patent produces for him at home, and the small cost now renders it possible for almost every patentee in this country to secure a patent in Great Britain, where his rights are as well protected as in the United States.

OTHER COUNTRIES.—Patents are also obtained on very reasonable terms in France, Belgium, Germany Austria, Russia, Italy, Spain (the latter includes Cuba and all the other Spanish Colonies), Brazil, British India Australia, and the other British Colonies.

An experience of FORTY years has enabled the publishers of THE SCIENTIFIC AMERICAN to establish competent and trustworthy agencies in all the principal foreign countries, and it has always been their aim to have the business of their clients promptly and properly done and their interests faithfully guarded.

A pamphlet containing a synopsis of the patent laws of all countries, including the cost for each, and other information useful to persons contemplating the procuring of patents abroad, may be had on application to this office.

MUNN & CO., Editors and Proprietors of THE SCIENTIFIC AMERICAN, cordially invite all persons desiring any information relative to patents, or the registry of trade-marks, in this country or abroad, to call at their offices, 361 Broadway. Examination of inventions, consultation, and advice free. Inquiries by mail promptly answered.

Address, **MUNN & CO.,**
Publishers and Patent Solicitors,
361 Broadway, New York.

BRANCH OFFICES: No. 622 and 624 F Street, Pacific Building, near 7th Street, Washington, D. C.

The Scientific American
PUBLICATIONS FOR 1888.

The prices of the different publications in the United States, Canada, and Mexico are as follows:

RATES BY MAIL.

The Scientific American (weekly), one year	$3.00
The Scientific American Supplement (weekly), one year	5.00
The Scientific American, Export Edition (monthly) one year	5.00
The Scientific American, Architects and Builders Edition (monthly), one year	2.50

COMBINED RATES.

The Scientific American and Supplement,	$7.00
The Scientific American and Architects and Builders Edition,	5.00
The Scientific American, Supplement, and Architects and Builders Edition,	9.00

Proportionate Rates for Six Months.

This includes postage, which we pay. Remit by postal or express money order, or draft to order of
MUNN & CO., 361 Broadway, New York.

ELIXIR Grows Full Beard, Moustache and Hair in 30 days. Man, Woman, Girl or Boy. Anybody $5 a day. We mail a $5 size OUTFIT FREE for 40c. in stamps to pay charges. Smith Manf. Co., Palatine, Ills.

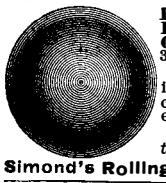
© 1888 SCIENTIFIC AMERICAN, INC.

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

STEEL BALLS.



For Anti-Friction Bearings, of Best Cast Steel. Hardened, Ground, and Burnished, from 3-16in. to 2 in. diameter.

In quality and density of metal, in uniformity of temper, and in accuracy and nicety of finish warranted unequaled.

☞ *Samples and prices on application.*

Simond's Rolling-Machine Co., Fitchburg, Mass.

BRONZE RELIEFS

Make an Everlasting Portrait. We produce them from photographs of yourself or departed friends. Perfect likeness every time. CHAS. A. BAILEY, Sculptor, Box 988, MIDDLETOWN, CONN. *Mention this paper.*

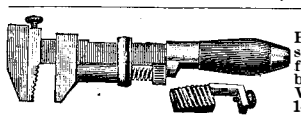
MALLEABLE AND FINE GRAY IRON ALSO STEEL CASTINGS FROM SPECIAL PATTERNS. **T. HOMAS DEVLIN & CO.** FINE TINNING, JAPANNING AND FINISHING. LEHIGH AVE. & AMERICAN ST. PHILA.

GAS ENGINEERING, RECENT PROgress in.—By A. Macpherson. Regenerative system of retort firing. Improvements in gas purification. Burners and regenerative lamps. The Welsbach gas light, Paraffin as a rival of coal gas, oil in gas making. Prices of residual products. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **601.** Price 10 cents. To be had at this office and from all newsdealers.

DELAFIELD'S PAT. SAW CLAMP

With saw for cutting metals. Saves all the broken hack-saw blades. In use over two years in all parts of the country. The new clamps have the edges bevelled that hold the saw. By mail, with one blade, 50 cents. Extra blades 8½" x ½", "Star," 7 cents each, 70 cents per dozen, by mail. Blades 8" x 1", "Stubs," 35 cents each, by mail. Discount to dealers.

NOROTON MFG. WORKS, Noroton, Conn.



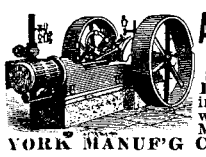
Makes a perfect Pipe Wrench of any screw wrench. Send for circular. 75 cents by mail. H. W. ATWATER, P. O. Box 1452, N. Y. City.

THE AMERICAN BELL TELEPHONE CO.

95 MILK ST., BOSTON, MASS.

This Company owns the Letters Patent granted to Alexander Graham Bell, March 7th, 1876, No. 174,465, and January 30th, 1877, No. 186,787.

The transmission of Speech by all known forms of Electric Speaking Telephones infringes the right secured to this Company by the above patents, and renders each individual user of telephones not furnished by it or its licensees responsible for such unlawful use, and all the consequences thereof, and liable to suit therefor.



Automatic Cut Off Engines

Horizontal and Vertical.

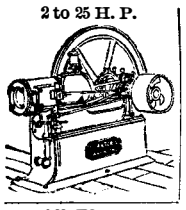
Specially adapted for **Electric Lighting, Yacht** and Hoisting Engines. Turbine water wheels. Constructors of Special Machinery of any description.

YORK MANUF'G CO., YORK, PA., U. S. A.

SHIP WAVES.—BY SIR WILLIAM Thomson. A lecture delivered before the Institution of Mechanical Engineers.—Definition of wave. The different kinds of waves. Waves produced in water by boats and the wind. How the wave procession is kept up. Effect of a ship's build in causing waves: With eight figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT No. **615.** Price ten cents. To be had at this office and from all newsdealers.

CHARTER'S GAS ENGINE.

2 to 25 H. P.



The Simplest, most Reliable, and Economical Gas Engine in existence.

An impulse at every revolution. Perfect steadiness guaranteed for Arc or Incandescent Electric Lights.

Independent of gas works when desired, and **makes its own gas** at a cost of **65 cents per M feet,** or about **one cent per hour to each indicated H. P.**

A Perfectly Safe Motor for All Places and Purposes.

New York Agent, JOHN J. BOCKIE, 47 Dey Street.

Chicago Agent, H. H. LATHAM, 318 Dearborn Street.

Williams & Orton Mfg. Co.

P. O. Box 148. STERLING, ILL.

PATENTS.

MESSRS. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine improvements, and to act as Solicitors of Patents for Inventors.

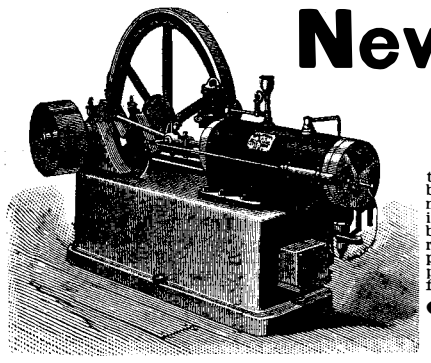
In this line of business they have had *forty-one years experience*, and now have *unequaled facilities* for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs Munn & Co. also attend to the preparation of Caveats, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very reasonable terms

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

We also send, *freeof charge*, a Synopsis of Foreign Patent Laws, showing the cost and method of securing patents in all the principal countries of the world.

MUNN & CO., Solicitors of Patents,
361 Broadway, New York.

BRANCH OFFICES.—No. 622 and 624 F Street, Pacific Building, near 7th Street, Washington, D. C.



New Gas Engine "The Baldwin"

Exhibited at the late American Institute Fair, New York.

A four horse-power engine in connection with storage battery, running 84 incandescent electric lights (and without battery, 32 lights), giving a perfect light, with all the steadiness that can be obtained from the high-speed steam engines in common use for electric lighting, and permitting any number of lights to be shut off or turned on without affecting the remaining lights in the slightest degree. A marvel of beauty, perfection, and power, adapted to lighting, pumping, and all purposes where a safe and cheap power is required. Manufactured and guaranteed by

Otis Brothers & Co.
Elevators and Hoisting Machinery,
38 PARK ROW, NEW YORK.

THE COPYING PAD.—HOW TO MAKE and how to use; with an engraving. Practical directions how to prepare the gelatine pad, and also the aniline ink by which the copies are made; how to apply the written letter to the pad; how to take off copies of the letter. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **438.** Price 10 cents. For sale at this office and by all newsdealers in all parts of the country.

H. W. JOHNS' ASBESTOS STEAM PACKING

Boiler Coverings, Millboard, Roofing, Building Felt, Liquid Paints, Etc.

DESCRIPTIVE PRICE LIST AND SAMPLES SENT FREE.

H. W. JOHNS MFG. CO., 87 Maiden Lane, N. Y.

PHTHISIS.—A PAPER BY DR. H. C. Wood, describing in detail the new treatment of consumption by sulphureted hydrogen. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **594.** Price 10 cents. To be had at this office and from all newsdealers.

PRESERVATION OF MEAT Without Cans—Egg shell method. Apply to DR. SALZER, 613 Park Ave., Baltimore, Md.

SEAMLESS BRASS & COPPER TUBES, SHEET BRASS, BRASS WIRE
FINE TOOLS FOR MACHINISTS
SEND FOR CATALOGUE
175-177 LAKE ST. CHICAGO.

Mention this paper.

PANAMA CANAL.—A PAPER BY DR. W. Nelson on some of the difficulties to be overcome in the prosecution of this work. Damming the Chagres River. Extent of the earth cutting. Ocean tides. The climate. Prevalent diseases. Cost of the canal in lives. Cost of the work. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **603.** Price 10 cents. To be had at this office and from all newsdealers.

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO. HARTFORD, CONN.

CASTING METALS UPON COMBUSTIble Materials.—A paper by A. E. Outerbridge Jr., describing a process of casting iron and other metals upon lace, embroideries, fern fronds, and other combustible materials. With 4 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **601.** Price 10 cents. To be had at this office and from all newsdealers.

Novelty Hot Air Furnaces.

Expose an Immense Heated Surface.

Extract all the Heat from the Gases. Furnish Pure Warm Air in Abundance.

Fourteen Years of Test. Universally satisfactory.

Send for "Our Furnace Book."

Abram Cox Stove Co., MANUFACTURERS, Philadelphia and Chicago.

INVENTORS and others desiring new articles manufactured and introduced, address P. O. Box 86, Cleveland, O.

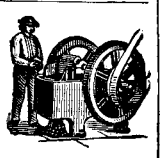
The Original Unvulcanized Packing.

CALLED THE STANDARD—As it is the Packing by which all others are compared.

Accept no packing as JENKINS PACKING unless stamped with our "Trade Mark."

JENKINS BROS. 71 John Street, N. Y. 105 Milk street, Boston. 15 So. Fourth St., Phila. 54 Dearborn St., Chicago.

ROCK BREAKERS AND ORE CRUSHERS.



We manufacture and supply at short notice and lowest rates, Stone and Ore Crushers, containing the invention described in Letters Patent issued to Eli W. Blake, June 15th, 1858, together with NEW AND VALUABLE IMPROVEMENTS, for which Letters Patent were granted May 11th and July 20th, 1880, to Mr. S. L. Marsden. All Crushers supplied by us are constructed under the superintendence of Mr. Marsden, who, for the past twenty years, has been connected with the manufacture of Blake Crushers in this country and England.

FARREL FOUNDRY and MACHINE CO., Manufacturers, Ansonia, Conn.
COPELAND & BACON, Agents, NEW YORK and PHILADELPHIA.

Steam! Steam!

We build Automatic Engines from 2 to 200 H. P., equal to anything in market.

A Large Lot of 2, 3, and 4-H. Engines

With or without boilers, **low for cash,**

B. W. PAYNE & SONS,

Box 15, **Elmira, N. Y.**

WIRE ROPE

Address JOHN A. ROEBLING'S SONS, Manufacturers, Trenton, N. J., or 117 Liberty Street, New York.

Wheels and Rope for conveying power long distances. Send for circular.

LEAD SMELTING.—A FULL DESCRIPtion of the Lewis Bartlett process, by William Ramsay; illustrated with 9 engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **593.** Price 10 cents. To be had at this office and from all newsdealers.

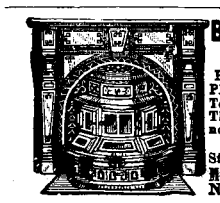
TO BUSINESS MEN.

The value of the SCIENTIFIC AMERICAN as an advertising medium cannot be overestimated. Its circulation is many times greater than that of any similar journal now published. It goes into all the States and Territories, and is read in all the principal libraries and reading rooms of the world. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. This he has when he advertises in the SCIENTIFIC AMERICAN. And do not let the advertising agent influence you to substitute some other paper for the SCIENTIFIC AMERICAN, when selecting a list of publications in which you decide it is for your interest to advertise. This is frequently done, for the reason that the agent gets a larger commission from the papers having a small circulation than is allowed on the SCIENTIFIC AMERICAN.

For rates see top of first column of this page, or address

MUNN & CO., Publishers,
361 Broadway, New York.

STORAGE BATTERIES FOR ELECtric Locomotion.—A paper by A. Reckenzaun, offering a few facts and figures relating to the present state of the subject of the application of storage batteries to locomotive purposes. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **625.** Price 10 cents. To be had at this office and from all newsdealers.



BIBB'S Celebrated Original BALTIMORE FIRE-PLACE HEATERS

To warm upper and lower rooms The Handsomest and Most Economical Coal Stoves in the world.

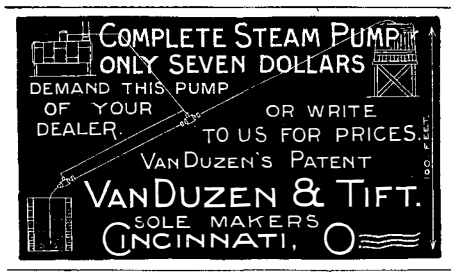
B. C. BIBB & SON
Stove Founders, Baltimore, Md.
MARBLEIZED SLATE MANTELS
New and Beautiful Designs.

Scientific Book Catalogue

RECENTLY PUBLISHED.

Our new catalogue containing over 100 pages, including works on more than fifty different subjects. Will be mailed free to any address on application.

MUNN & CO., Publishers Scientific American,
361 Broadway, New York.



PROPULSION OF STREET CARS.—A paper by A. W. Wright, in which an endeavor is made to solve the problem as to the amount of power required to start a street car and keep it in motion under average conditions. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **533.** Price 10 cents. To be had at this office and from all newsdealers.

WEITMYER PATENT FURNACE

BOILERS OF EVERY DESCRIPTION.

IDE Automatic Engines, Traction and Portable Engines

STEAM ROAD ROLLERS.

Manufactured by Foundry and Machine Department,
Harrisburg, Pa., U. S. A.

ICE and REFRIGERATING MACHINES

The Pictet Artificial Ice Company (Limited), Room 6, Coal & Iron Exchange, New York.

CHALLENGE EMERY GRINDING & POLISHING MACHINERY

DIESEL M'F'G CO. THIRD AND CUMBERLAND. PHILA.

CHEMICAL AND ALLIED INDUStries.—By Watson Smith. An elaborate report upon the objects illustrative of the progress, advance, and present position of the chemical industries shown at the Manchester Royal Jubilee Exhibition. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NOS. **627, 628, 629, 630, 632.** Price 10 cents each or 50 cents for the series. To be had at this office and from all newsdealers.

SYRACUSE MALLEABLE IRON WORKS

W. B. BURNS PROP'R.

JAMES B. EADS.—AN ACCOUNT OF the life and labors of this eminent engineer. With a portrait. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **592.** Price 10 cents. To be had at this office and from all newsdealers.

BRASS WORK

Small Brass Work & Models A Specialty,
Also Nickel Plating.
T. L. McKEEN,
Easton, Penn.

HOW TO MAKE AN INCUBATOR.—Full directions, illustrated with 7 figures. Also directions for operating the apparatus. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **612.** Price 10 cents. To be had at this office and from all newsdealers.

AUTOMATIC CUT OFF ENGINES PERFECTLY GOVERNED

MANUFACTURED UPON SCIENTIFIC AND PRACTICAL PRINCIPLES

BALL ENGINE CO. ERIE PA.

SAWS Wanted 50,000 Sawyers and Lumbermen to send us their full address for a copy of Emerson's ☞ Book of **SAWS.** We are first to introduce NATURAL GAS for heating and tempering **Saws** with wonderful effect upon improving their quality and toughness, enabling us to reduce prices. Address **EMERSON, SMITH & CO. (Ltd.),** **Beaver Falls, Pa.** **SAWS**

THE Scientific American

ESTABLISHED 1846.

The Most Popular Scientific Paper in the World.

Only $3.00 a Year, including Postage. Weekly. 52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc. Complete List of Patents each week.

Terms of Subscription.—One copy of the SCIENTIFIC AMERICAN will be sent for *one year*—52 numbers—postage prepaid, to any subscriber in the United States or Canada, on receipt of **three dollars** by the publishers; six months, $1.50; three months, $1.00.

Clubs.—Special rates for several names, and to Post Masters. Write for particulars.

The safest way to remit is by Postal Order, Draft, or Express Money Order. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO.,
361 Broadway, New York.

THE Scientific American Supplement.

This is a separate and distinct publication from THE SCIENTIFIC AMERICAN, but is uniform therewith in size, every number containing sixteen large pages full of engravings, many of which are taken from foreign papers, and accompanied with translated descriptions. THE SCIENTIFIC AMERICAN SUPPLEMENT is published weekly, and includes a very wide range of contents. It presents the most recent papers by eminent writers in all the principal departments of Science and the Useful Arts, embracing Biology, Geology, Mineralogy, Natural History, Geography, Archæology, Astronomy, Chemistry, Electricity, Light, Heat, Mechanical Engineering, Steam and Railway Engineering, Mining, Ship Building, Marine Engineering, Photography, Technology, Manufacturing Industries, Sanitary Engineering, Agriculture, Horticulture, Domestic Economy, Biography, Medicine, etc. A vast amount of fresh and valuable information obtainable in no other publication.

The most important Engineering Works, Mechanisms, and Manufactures at home and abroad are illustrated and described in the SUPPLEMENT.

Price for the SUPPLEMENT for the United States and Canada, $5.00 a year, or one copy of the SCIENTIFIC AMERICAN and one copy of the SUPPLEMENT, both mailed for one year for $7.00. Single copies 10 cents. Address and remit by postal order, express money order, or check,

MUNN & Co., 361 Broadway, N. Y.,
Publishers SCIENTIFIC AMERICAN.

Builders Edition.

THE SCIENTIFIC AMERICAN ARCHITECTS' AND BUILDERS' EDITION is issued monthly. $2.50 a year. Single copies, 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages; forming a large and splendid **Magazine of Architecture,** richly adorned with *elegant plates in colors*, and with other fine engravings; illustrating the most interesting examples of modern Architectural Construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with full Plans, Specifications, Sheets of Details, Estimates, etc.

The elegance and cheapness of this magnificent work have won for it the **Largest Circulation** of any Architectural publication in the world. Sold by al newsdealers. $2.50 a year. Remit to

MUNN & CO., Publishers,
361 Broadway, New York.

PRINTING INKS.

THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts., Phila., and 47 Rose St., opp, Duane St., N. Y.

© 1888 SCIENTIFIC AMERICAN, INC.